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The answer of the Philadelphia & Reading in the suit brought by the government against the anthracite coal roads, published in another column, contends that the "commodities clause" of the Hepburn act is unconstitutional. The Reading has another string to its bow in that the Railway Company does not own, directly or indirectly, shares in the coal company. A great many of the anthracite roads, however, will have to rely solely on the contention that the "commodities clause" is unconstitutional. In the oral argument of T. C. Spelling for the people v. the Central of New Jersey and other roads, two main contentions are dwelt on. The "commodities clause" is comparable with, but not the same as the police power of the state. This similarity between the power of Congress to regulate interstate commerce and its police power is strongly relied on, and the case of *United States v. 43 Gallons of Whiskey*, where the government was upheld, not only in confiscating whiskey that was being brought to an Indian reservation, but also the other goods that were being carried with the whiskey, is quoted and a parallel drawn. Congress may regulate interstate commerce, even as far as absolutely prohibiting the transportation of certain kinds of goods, as in the lottery cases. There seems in this part of Mr. Spelling's argument not to be a direct parallel between the cases cited and the case before the court, because in both the *United States v. 43 Gallons of Whiskey* and the lottery case the goods carried are the subject of almost universal police regulation, while coal can in no way be shown in itself to be injurious to the public health or morals. The second contention of the people is that the "commodities clause" is in substance a law which makes a single act in a series evidence that the other acts in that series have been committed. The argument is that a road by carrying coal in which it has an interest, shows that it is violating the Anti-Trust law, although the mere carrying of coal in which it has an interest may not be a violation, in itself, of the Anti-Trust law. That is, the carrying of coal alone would not prove, without this "commodities clause," that the railroad company was violating the Anti-Trust law. By enacting the "commodities clause," Congress has made the fact that a road is carrying coal in which it has an interest conclusive proof that the railroad company is violating the Anti-Trust law. It remains to be seen whether the courts will uphold a contention which greatly enlarges the scope of the Anti-Trust law, especially at a time when a good many statesmen think that this special law needs a pruning rather than a grafting.

THE RAILROAD IN PARTY POLITICS.

One does not have to set the microscope upon the history of party politics and policies in this country or in England to discover some dramatic reversals of parties. In our motherland, in such great issues as the free trade question and Irish home rule, one finds such reversals under Peel, Disraeli and Gladstone. The Democratic party in this country was fundamentally a party of popular rights and liberties; yet it allied itself with the aristocracy of slave-owners at the South. *Per contra* the Federal and Whig organizations represented properly, conservatism and, in a certain sense, northern aristocracy; yet they gave rise to the radical abolition party, slightly antedated, perhaps, by the free soil Democrats, and the Republican party, the lineal successor, became anti-slavery. The Republican party for ten years after the civil war upheld carpet-bag rule at the South, but reversed that policy abruptly under President Hayes. The Democratic party was fundamentally for hard money; but in 1896 was swept into the free silver vortex.

For the last two or three years the country has been abreast of another of those reversals of party, but under unique and almost fantastic conditions. It has been, in some respects, an economic rather than a political reversal, related particularly to the railroads, and in a somewhat less degree to the trusts. The dominant party has been in the main a party of property, a party of capital, a party in its elemental character of conservatism, however that conservatism may in special and personal instances have been abused. But a single aggressive mind fixed at the center of presidential power and leadership has been able to warp the party from its old moorings. The keynote of conservatism, for the time being only, let us trust, has changed to the note of radicalism. The same spirit of course reached through all the tentacles of administration. It has pervaded state legislatures. It has overmuch reached down among the people. It has stimulated labor organization. And the railroad, with the possible exception of real estate, the most conservative form of American investment, and bracketed with manufacturing as one leading national industry outside of agriculture, has had to bear almost the full onset of the new forces. It has "got into politics," with its 300,000 or more stockholders, not of its own volition, but by the sweep of an external personal force acting on the organization of a party whose capitalistic members naturally find themselves, to use the mildest term, dazed at the party's reversal of policy, if not of principle.

As seen superficially the peril of the future rests not so much upon the reactionary personal impulse within a single party organization, which has pulled the railroads into politics, as on simultaneous and similar outward tendencies in both the leading parties The check on any issue, raised under popular government by one party organization, has usually been the opposition of the other. In this country it has been so on the tariff, on finance, on the larger questions of consti-

tutional limitation. But for many months and for some years people, with some plausibility, have been saying that toward the railroads the policy of the two parties has been identical, or, if differing, has differed only in degree and locality. If this were a continuing and persistent fact it would be a most sinister one. It would signify for the railroads, involuntarily thrust into the political arena less as gladiators than as victims, the exchange of one persecution for another. It would mean a rivalry of parties to see which would do its worst by our great transportation systems. And it would forecast, worst of all, the ultimate extinction of the protective power of the courts. Nor would the wreck of property interests be limited to railroads.

But happily for the future there is no such counsel of despair or even of pessimism. In the foreground of hope stands the exchange of presidential personalities and of party leadership, indexing in one event new methods, if not new policies—as well as a benign shifting of temperaments—and, in the other, unlooked for event of the election, at the worst a deadlock and four years of peace. But the real safety in a situation where so strong elements in both parties have seemingly been hostile to the railroads which they have dragged into party politics, rests on a base that far underlies persons or leaders. There is the property-holding interest of the land as a whole, ranging from the man with $10 in the savings bank up to the millionaire, with its vast roster of votes. There is the inevitable reaction that follows as soon as that property interest is roughly touched. Finally, there is the certainty that no two great parties can ever hold together long on any such policy as railroad baiting. Opposition is the law of party existence, and when there happens to be coincidence of policy it is apt to be accidental, and is sure to be transitory. For the last year or two we have been witnessing a strange epoch of party reversal under an autocratic rulership, with the railroad as one of its objective points, but a rulership soon to end. It will be much more strange if within the year to come we do not find the railroad receding from party politics and resuming its old place as an economic rather than civic proposition. It will figure in the coming turmoils of the presidential campaign, and doubtless be the target of the lurid oratory of the stump. But beyond that sea of wordy froth is the calm port of national conservatism, sobriety and common sense.

RESULTS WITH PIECE-WORK.

The inquiry which we have been making about piece-work in railroad shops has brought forth some notable replies, but none of greater importance or interest than that which we print this week. The writer of the present contribution—the name of whose road we are not at liberty to disclose—shows with absolute clearness what the economies of piece-work have been on a large system, and demonstrates that the gains to the individual have been fully as great as the gains to the company. If the 772 engines repaired in 1906 had received general repairs to tires, boxes, flues and machinery under the non-piece-work conditions existing in 1904 and 1905, the additional cost to the company would have been $163,470, or $211.75 per engine, whereas the average rate per hour for all machinists working piece-work on the system in January, 1907, was 34.2 cents, as against 25.9 cents, average rate for day work during the same month—a gain to the individual workman of one-third. Yet this railroad had a severe struggle with the mechanics' union on the piece-work question, because it was clear to the officers of the union that it would sooner or later be a fight to the death, and that all-powerful unions could not retain their prestige in piece-work shops. In calling attention to this subject again and again, we feel strongly that railroad managers should realize that the piece-work idea has three sides, no one of which they can afford to overlook. It enables work to be done cheaply; it gives the employee bigger profits, and it imbues him with the dignity of successful effort that is the antithesis of the standard of the dullest, which the union seeks to enforce. Our contributor thinks that the present business depression affords a very opportune time to adopt piece-work methods, while, if the present time is allowed to pass unimproved he doubts whether the same advantage will be offered again for years to come. He thinks, also, that a fixed policy with reference to piece-work ought to be outlined by the heads of the principal railroads and placed in the hands of officers of the mechanical department, to be put gradually into effect as opportunity offers.

It seems to us that the year 1907 was in many ways the period of the greatest crisis in labor affairs which the country has ever passed through. It is certain that there has never been a year when railroad officers had so little actual control over the men whom they employed. The right to discharge was the only real power left in their hands, and this was scarcely worth exercising at a time when there were more jobs than men to fill them. The great change in efficiency which the last eight months has seen, came about simply because of the restored value of this power to discharge. The best men were kept and all the rest that could be spared were let go, so that although specific wages were not materially affected by the standard of the brightest, the primary question of employment was directly affected by it, and there was no room at all for the man who represented only the deadening average of effort; consequently, the railroad work of the country is being done more efficiently this summer than it has been done in many years.

But how long is this particular kind of efficiency going to be enforcible? If no change is made in the labor system, it will last just as long as hard times last and no longer. On the other hand, if even a small nucleus of the railroad forces can be shaken free from the sluggish day-work standards, at a time like this, when conditions are particularly favorable for a change, the efficiency is going to remain after good times come back. We have constantly maintained that applications of the individual system are only in their infancy as yet. The clear labor lesson of the years of congested business, ending with the fall of 1907, is that if you want efficiency you must pay for efficiency, and not for something else, such as a specified number of hours of employment without reference as to how the hours are used. Wide attention has been given to the extremely interesting series of articles which a towerman of the Boston & Maine Railroad has been running in the *Atlantic Monthly*. The principal point brought out in Mr. Fagan's discussion is that railroad employees do not care; they are not interested in the same things that the management is interested in. They have no personal relation with the company as a company, other than that of performing specific work and drawing specific pay. So far as Mr. Fagan offers any solution for the difficulties which he clearly outlines, it is that the men shall somehow (he does not say how) be made to observe operating rules, and that in case of an accident infraction of rules should be the first thing looked for.

Our own belief is somewhat different. The way to make a man interested in any kind of an enterprise is to make him a partner in it. That done, he can safely be relied upon to make rules for himself and to discipline himself for infraction of them. Does not the application of the piece-work principle afford the easiest and most rational method at hand for making a great body of employees partners in the railroad enterprise? Given a thoroughly good working example in the mechanical department, is it not probable new light will come upon the solution of the grave difficulties connected with getting efficiency into the lower branches of the operating and traffic departments? We have thus far discussed the mechanical department only, because a start can be made there most easily.

The specific wages paid employees and the results gotten from them bear a certain analogy to the profits paid stockholders and the freight and passenger rates charged. The mistake in thinking that the freight rates on a certain railroad

must be too high because the company pays large dividends is no greater than the mistake in believing that a piece-work mechanic who earns $4 a day costs the company more than a day-work mechanic who earns $2.50 a day. Moreover, the analogy can be carried a step further. The railroad that earns large profits is going to serve the country better than the railroad that earns small ones, and the mechanic who makes a very good living is going to serve his company more loyally than the one who makes a poor one, and is interested more in hours than in output.

RAILROAD ELECTRIFICATION.

We reprint in another column part of a paper from *Engineering*, London, on the progress of railroad electrification on the Continent. In the midst of the active discussion on this subject, it is well worth while occasionally to take under advisement the general, broad situation, as measured by actual installations and the results gotten from them. The paper presented a few months ago to the Canadian Railway Club by H. L. Kirker, resident engineer of the Westinghouse Company at the St. Clair tunnel, furnishes a valuable summary of this kind. The author has a natural and proper inclination to view the means to be employed in electrification through the glasses of the methods advocated by his own company, but this does not prevent him from making a thoroughly useful review of electric installations. In his opening paragraph, he lays it down as axiomatic that the objects sought in a change from steam to electricity are increased capacity, improved service and reduced operating expenses, while direct current, single-phase and three-phase are the means to these ends.

Yet when the final analysis of most of these reasons is made, it usually resolves itself into the classical statement of Mr. Aspinall, of the Lancashire & Yorkshire, that electrification is undertaken not to save money, but to make money. Mr. Kirker says: "There are enthusiasts who maintain that an electric locomotive can do for a dollar what a steam locomotive does for two. There are moderates who believe that dollar for dollar is the ratio. There are pessimists who do not believe that the electric locomotive can do as much for a dollar as the steam locomotive can do for the same amount. But when it comes to the practical application of the work we recur again to the principle laid down that improvement of service and capacity are the fundamental reason for the work and, as Mr. McHenry, of the New Haven road, says, it is altogether improbable that the saving resulting from the simple substitution of electric for steam power will be sufficient to justify the additional investment and financial risk."

And then what does this increase of capacity mean? To those who review the railroad situation from a mechanical standpoint as it has existed during the past thirty years, it will be apparent that there have been two or three occasions when it appeared as though the final limit had been reached in the ability to build locomotives of sufficient capacity to do the work demanded of them. These crises have been met, however, by sudden and radical improvements and then the increase in size has gone on again. We are confronted now by such a crisis, for it seems as though the limit had been reached, not only in the weights that it is possible to put on the wheels, but in the capacity of the locomotive to do work. To be sure, the heaviest locomotives have not yet been so widely introduced that there is not room for a great deal of improvement, and opinions may be quoted from such observers as J. J. Hill, E. H. Harriman, W. C. Brown and F. A. Delano to the effect that large sums will be required to increase capacity in the future, some competent critics even going to the extent of saying that as much will be required for this purpose as was needed to create the roads in the first place.

At points such as terminals and tunnels, where this limit is first reached, we find that electrification is first undertaken, and Mr. Kirker thinks that it is uneconomical to strain at increasing sizes to get a capacity that can be more readily duplicated by electric locomotives of a smaller unit. To substantiate this statement, the cases of the Mallet engines for the Baltimore & Ohio and the Erie are cited, in which, with weights of 167 and 205 tons on the drivers, a maximum drawbar pull of 71,500 lbs. and 94,800 lbs. respectively are obtained. This is met by the electric locomotives of the New York Central, with a weight of 70 tons and a possible continuous drawbar pull of 34,000 lbs. Two of these engines taken as a unit would have nearly the same drawbar pull as the Baltimore & Ohio Mallet and with a very material reduction in weight, while the engine in use in the St. Clair tunnel weighs less and has a greater tractive effort.

These are all points to be borne in mind, and they have received due consideration from all thinking men, but behind it all is the question of operation and the ability to meet individual conditions.

Thus far, the outcome of the discussion is to emphasize the old axiom that the engineer can do anything that is asked of him, provided funds are supplied, but that there is a wide difference between those things that are mechanically possible and those that are commercially possible. The discussion is tending to crystallize our information, so that the distinction between these two great possibilities can be more clearly distinguished.

We periodically pass through one of these transition stages, in which there are a variety of conflicting opinions upon a subject that looks as if it ought to be capable of a clear-cut, definite demonstration, but fails of that demonstration because identical appliances are not put into service under identical conditions. Hence, observers differ as to practicability. So in this matter of electrification, we had at first the enthusiastic claims of the electrician that the steam locomotive was obsolete and doomed to immediate destruction because he had succeeded in hauling a few light street cars at speeds of 20 miles an hour! And it makes a curious commentary on the fact that the more a man knows and the more he accomplishes, the more clearly he sees his limitations, to observe that, as the electric service has increased and been improved all over the world, the narrower has become the range of the applications that are urged for it by its advocates. Now, instead of the quick disappearance of the steam locomotive we have statements to the effect that no one living will ever see it supplanted for transcontinental service; that it is best adapted to congested work in terminals, tunnels and on grades where water-power is available for the generation of the current, and that, in any event, it will come as the result of a long and careful development and not as a quick revolution, and that, when it does come, it will call for a readjustment of conditions, just as the introduction of the steam locomotive called for a readjustment of the conditions existing when the stage coach was the common passenger carrier of the world.

NEW PUBLICATIONS.

The 20th Century Toolsmith and Steelworker. By H. Holford. Chicago: Frederick J. Drake & Co. 240 pages; 5¼ x 7½ in.; 118 illustrations; cloth. Price, $1.50.

The book has many defects, and much usefulness. The style of the introduction is vain and grandiose, and there is a marked failure of agreement between noun and verb, and a use of the word to "learn" in the passive tense that is rare among authors. The reader is thus quite prepared for the first chapter, which is a cursory discourse on steel, of little value and filled with platitudes. This, however, is but a warming up canter, and when the second chapter is reached the author settles down to work, and begins to show that, as a practical machinist, he is familiar with his subject. Always boastful, he nevertheless shows a familiarity with the working of steel and many of its properties, and enters with great detail into the methods of making the tools and implements that he describes. Moreover, he gives reasons for what he does, that show the results of long training and close

observation. He is especially emphatic in his insistance on the care and deliberation to be exercised in heating, and the way in which the steel should be struck by the hammer. To those who are familiar with tool making, the value of this will readily be understood. In hardening and tempering, the necessity is clearly set forth that this condition of the steel should be localized, and yet the structure of the metal so cared for that it shades back gradually from the hard to the soft metal without having any sharp line of demarkation between the two to set up internal stresses. It is in the setting forth of points like these that the book is valuable. It does not confine itself to a dogmatic description of the method to be followed, but accompanies it with the reason why. Take so simple a tool as a cold chisel, for example. Minute directions are given as to heating and hammering, where the blows should be struck, how they should start from the center and work out to the edge on the flat side, and that under no circumstances should the edge be struck in the finishing. Then the hardening and tempering are taken up in such detail that it seems as though the veriest novice could do the work, if he would but follow instructions. But, when we consider the delicacy of the operation, it is small wonder that we find it quite out of the question to buy a decent cold chisel at the hardware store.

The experience of the author has evidently been very extensive, as he enters with the same detail into the processes of making tools for blacksmiths, machinists, carpenters, butchers, stone cutters, horse shoers and bricklayers, and concludes with a long schedule of the class of steel which should be used for each tool, and a corresponding schedule of the color to which the temper should be drawn. In this, of course, only an indication can be given, which must be supplemented by that experience by which alone the subtle meaning of these fleeting colors can be obtained, and of which no illustrations can fully convey the idea.

Throughout the book the chapters are usually opened with a statement tending to show the ignorance of the average blacksmith, and the lamentable results of such ignorance as exemplified in his work, followed by a description of the way "I" do it. It is a pity that a book of such merit, and one that cannot fail to be of real value to every working toolmaker, who studies it, should be marred on almost every page by the indications of the glaring egotism of its author.

Letters to the Editor.

NEBRASKA STATE RAILWAY EMPLOYEES' PROTECTIVE ASSOCIATION.

Omaha, Neb., August 1, 1908.

To the Editor of the Railroad Age Gazette:

On April 27 of this year a movement was started among railroad employees in Nebraska so spontaneous in its character as to be the wonder of every one who is in any way interested in the railroad and political situation in this state.

Organizations of employees, such as conductors, switchmen, firemen, engineers, etc., sent a committee to Lincoln to appear before the State Railroad Commission to ask for a hearing, protesting against the lowering of freight rates in the state at this time, further than was done by legislation already in existence. This committee was composed entirely of Chicago, Burlington & Quincy employees.

It was thought by those in charge that a representation from all roads in the state should take part, and from this movement the present organization has sprung.

The committee as above mentioned appeared before the railroad commissioners of Nebraska, and in plain and unmistakable language showed the fallacy of reductions in rates that kept the railroad man out of employment by the necessary curtailment of expenses consequent on such reductions and that benefited only shippers who formerly were the recipients of the rebate. This organization is called "The Nebraska State Railway Employees' Protective Association," and is composed of railroad employees in the state only. An executive committee, or state committee, more properly speaking, is in the field organizing, and in its first sixty days' work put on the books of the association over 12,000 names, for which every man has paid his subscription.

The present movement on the part of the railroad men of Nebraska—and not only Nebraska but other states, because it has spread to Iowa and Kansas—has been brought about by the severe anti-railroad legislation. It is quite apparent that railroad men generally are made catspaws to pull political chestnuts out of the fire, and that they are being ground between two millstones. If we assert our rights the cry is started that we are wearing the "brass collar," and now that we have this association we are asked by political demagogues if we are making threats and invited to sit idly by and see our source of revenue depleted. If the railroad men will continue to stand together in the present movement—and we feel sure they will—a house-cleaning will follow that will be to the everlasting credit of the American people and of vast material benefit. Railroad employees themselves have been indifferent to the aggressiveness of the anti-railroad element. This lethargy has enabled those who are playing to the galleries to profit politically and financially until the railroad man is left "holding the sack."

The above is in a nutshell the reason that the Nebraska State Railway Employees' Protective Association is in existence. The association will take part in politics in all elections where the interests of its members are concerned, and will in every way endeavor to protect the interests of the railroad employee in the future by taking part in the making of laws affecting him and his family.

The popularity of this movement among all classes of employees may be imagined when at our first meeting we had over 500 and in the short space of sixty days could muster 2,500 votes in the city of Omaha.

There is no graft in this move and there is no money connected with it beyond that necessary for running expenses, as was mentioned. If every railroad employee will support this association by his individual effort we will soon become so powerful as to compel recognition politically and otherwise in the state and nation and secure a prosperous future for every employee in the state.

H. W. E. M'Daniel.
Vice-President, Nebraska State Railway, Employees' Protective Association.

LOOP EYES AND UPSET ENDS ON STEEL RODS.

Chicago, Ill., August 6, 1908.

To the Editor of the Railroad Age Gazette:

In Professor Malverd A. Howe's article on "Loop Eyes and Upset Ends on Steel Rods" no mention is made as to whether these rods were annealed. If they were bought in the open market, as stated, and no special reference made to annealing, it is probable that they were not annealed.

All standard bridge specifications require that such rods shall be annealed. The "Manufacturers Standard" specifications read: "In all cases where a steel piece in which the full strength is required has been partially tested, the whole piece must be subsequently annealed." Furthermore, it is usual to prohibit entirely the welding of steel, including the welding for loop eyes. Thus the specifications for steel railroad bridges of the American Railway Engineering and Maintenance of Way Association read: "Welds in steel will not be allowed."

Tests similar to those made by Professor Howe have been

made by bridge companies in the past in the regular course of their work. In the early days of the use of steel, I can remember some attempts made to substitute steel upset rods without annealing for iron rods in old Howe truss bridges and thereby increase the strength of these parts without changing other parts. Some of these steel rods afterwards developed cracks in use, and then tests were made at the Keystone Bridge Works. The results were similar to those obtained by Professor Howe and unsatisfactory. As to loop eyes, they should not be used even if annealed as welds are too unreliable in steel, and I believe loop eyes are not used by the best designers.

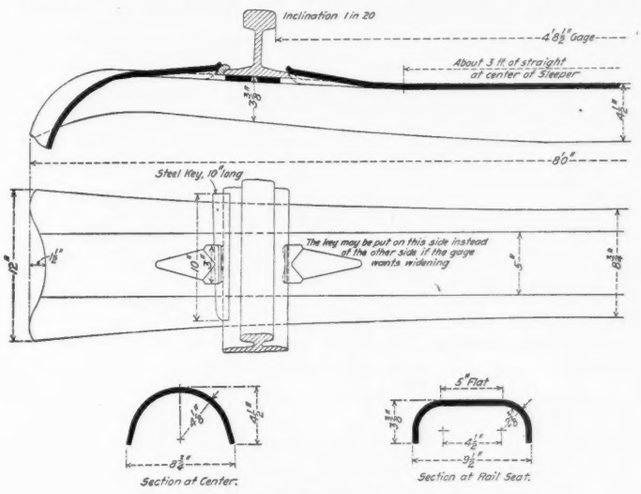
It is well that Professor Howe has called attention to these matters, even though this information is not new, as the probability is that many unannealed upset rods and rods with loop eyes find their way into construction work at the present time through oversight or thoughtlessness, if not ignorance, on the part of those in charge. C. L. STROBEL.

LIFE OF STEEL TIES.

34 Victoria St., Westminster, London, July 27, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

On page 27 of your issue for June 5 of this year, under the above title, Mr. W. C. Cushing's article included a drawing of the so-called Rendel steel tie, as it is used in India, together with specific statements of serious losses in weight due to corrosion. Sir A. M. Rendel, Consulting Engineer for the Mexican Railway and for some Indian railways, was probably the first to introduce steel sleepers in India and America. A blueprint, dated March 8, 1887, shows the Rendel tie as then used on the Mexican Railway. Its lines are quite nearly those of the Indian tie, shown in Mr. Cushing's article. The drawing herewith shows the present form of the Rendel tie. Its weight is a trifle over 124 lbs., or 127 lbs., including the two keys. The cost is said to be about $2. Sir A. M. Rendel furnishes to us the following notes on this subject:


Inclination 1 in 20
4'8½" Gage
About 3 ft. of straight at center of Sleeper
Steel Key, 10" long
The key may be put on this side instead of the other side if the gage wants widening
5" Flat
Section at Center.
Section at Rail Seat.

Mexican Railway Steel Tie.

Designed by Mr. Livesey. Introduced in India and Mexico by Sir A. M. Rendel.

The so-called "Rendel" tie was designed by Mr. Livesey and it incorrectly acquired its name because of the fact that Sir A. M. Rendel caused it to be introduced in India and in Mexico. The type sent out in 1887 weighed 110 lbs. Its service was entirely satisfactory, but owing to increased axle loads, the present type is made to weigh 124 lbs. These sleepers are rolled at one heat from a plate 80 to 100 ft. long, and cut and stamped to the form which resembles the half of a pea pod; hence this name is often given to them.

The rails are sidled in to the clips which are stamped out of the tie by the same blow which gives them their form, and held tight against one of the clip shoulders with a key driven in. The key is driven, as a rule, in the outside shoulder, but at curves one or both keys are driven into the inside shoulder to widen the gage. The experience of the Mexican Railway during these 20 years has been satisfactory. The ties are used on some steep gradients, one section of the line containing many miles of 1 in 23 and 1 in 30. On this section the ties are now placed 2 ft. 6 in. apart, centre to centre, the rails are 85 lb. and Fairlie locomotives weighing nearly 120 tons distributed over six axles are now being sent out for use on them. The increase in the weight per axle has necessitated this increased strength of track. The failures have been comparatively few and in some cases the repairs, due to cracking, are carried out on the spot. As regards their price, they may be said to be from about 10 shillings to 25 shillings a ton above the price of steel rails, varying according to the state of the market and the amount of work in the rolling mills.

The whole question of the life of the ties, according to Sir Alexander, is one of the nature of the soil. He does not think that ordinary soils, free from nitrates or other corrosive salts, are sufficient to rust them seriously if properly tarred, when made, even in damp countries. In fact, in Uganda the steel ties are being laid without ballasting the track and are being found quite satisfactory. Experience of long lengths of line in India, where Sir A. M. Rendel has been responsible for nearly all the steel ties introduced, tends to show that it is the presence of saltpetre in the soil which corrodes the sleepers and not merely the rain. Mexican experience has tended to confirm this as regards the corrosion resulting from the drippings of brine from the refrigerator cars.

It is a mistake to suppose that the supersession of wood by metal in India was due to the white ant. As a matter of fact the vibration prevents these being very serious, but there is increasing difficulty in obtaining either hard or soft wood. Creosoted fir, though it has been largely used, is difficult to get of good quality because English railroads take all the best. Neither was the introduction of steel ties in India necessary on account of the abnormally heavy traffic, which has been the reason of its adoption in certain parts of the States. For except on a short section of the East Indian Railway, on which the density of the goods traffic approaches that of the most crowded American lines, there are very few Indian lines on which the traffic would be thought considerable there. Hence there is less need for this great increase in the weight and strength of the tracks in India based upon American practice. The metal ties were, of course, used on the Continent long before we used them and they were mostly wrought iron or cast iron made in Belgium. A great number of cast iron ties have been and are still being sent to India, but they are double the weight of the steel ones. T. H. MINSHALL.

EARLY CONTINUOUS BRAKES.

London, August 1, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

May I correct a slight error in your editorial on Mr. Caruthers' paper dealing with "Early Continuous Brakes" in your issue of July 10? The Clark-Webb chain brake on the London & North Western was not the standard brake on that line until the company was obliged by the Board of Trade to adopt automatic action. I have read the Board of Trade Returns (continuous brakes) and find in the Return of June 30, 1882, that three engines and 25 carriages were fitted with the simple vacuum (Webb's system), which was only automatic on the vans. Special instructions were given in the Return as to the working of these brakes on the Irish Mail. In the returns of December 31, 1887, I find that 126 engines and 738 carriages were fitted with the automatic vacuum (Webb's system converted into automatic vacuum). The Board of Trade did not enforce its regulations to compel railroads to adopt an automatic brake until about 1890, I believe. The returns

show for June, 1890, a large proportion of railroads using the simple vacuum, displacing it for the automatic vacuum.

A. M. BUSHELL.

THE LAKE PONTCHARTRAIN BRIDGE.

Denver, Colo., August 3, 1908.

To the Editor of the Railroad Age Gazette:

I note the remark of Prof. Henry S. Jacoby, of Cornell University, on page 634 of your issue of July 31, that "the longest bridge, irrespective of the length of span or class of structure, is the pile trestle bridge on the Louisville & Nashville Railroad across Lake Pontchartrain, near New Orleans, La., which is about 21 miles long." No doubt Professor Jacoby refers to the bridge of the New Orleans & North-Eastern, since the Louisville & Nashville does not cross Lake Pontchartrain, but does cross the entrance to the lake at the Rigolets. The bridge of the New Orleans & North-Eastern across Lake Pontchartrain was originally 21 miles long but has been filled at either end until the length now only remains 5.72 miles.

JOHN I. BRENT.

THE LARGEST BRIDGE.

Ithaca, N. Y., August 4, 1908.

To the Editor of the Railroad Age Gazette:

Since the preparation of the article on the largest bridges in the world, published in your last issue, information has been received about a longer span of a simple riveted truss than that given in the second line of the table on page 634. Its span is 412 ft. 8 in., crosses French river, south of Rumford, Ontario, on the Canadian Pacific Railway and was completed in 1907. The span of the double-track plate girder bridge at Gardner, N. Y., should be 119 ft. 4 in. instead of 118½ ft., as given. The reference to the long wooden trestle bridge across Lake Pontchartrain contained two errors. A large part of the original structure has been filled in, making its length at present 30,706 ft., including two swing spans of 250 ft. each, or approximately six miles. It is located on the New Orleans & North-Eastern and not on the Louisville & Nashville.

HENRY S. JACOBY.

PICKED UP ON THE ROAD.

BY GULF.

The recent agitation over discipline for trainmen and the merits of written examinations reminds me of a little incident that happened not a thousand miles from New Orleans. On a road named after a member of the Trinity in a town whose name designates a place of worship there was an ex-conductor locally known as "Daddy," incapacitated by reason of his years and his voluminous avoirdupois, who served as signalman at an interlocking plant. On the road in question written examinations were and still are obligatory. One day the signal foreman called to inspect Daddy's plant and found the old man busily engaged in writing in a book, which, upon investigation, proved to be the standard printed examination for trainmen. The foreman was naturally surprised, as by no possibility could Daddy handle a train; so he inquired why he was taking the examination. "Oh," said Daddy, "Bill Jones has to take his examination for conductor, but he's a poor writer and, any way, he didn't want to miss a trip, so he got me to write it up for him."

This calls to mind another little incident. It was on this same road, that one day I noticed the engineman of a passenger train reading the daily newspaper as he pulled out of a station. Quite likely he was not neglecting his duty any more flagrantly than many another runner; than those, for instance, who, in lighting their pipes, or in imparting an important bit of gossip to the fireman, turn and face the tender for a minute or two at a time. But, to use an Anglicism, it was deuced bad form! That road needs surprise checking; and needs it in several different forms.

A REMARKABLE PIECE-WORK DOCUMENT.

We print herewith full comment on the economies of piece-work and the profits of it to the employee, together with a graphic illustration of the reasons why it is sometimes hard to introduce it. We are inclined to think that it is the most valuable piece-work document that has ever been published. At our request, the information was supplied by the mechanical superintendent of a large railroad, who prepared it for the president of the road, from whom we received it. The circumstances of the case are such that the identity of the road is not disclosed.

The following statement shows the percentage of piece-work in the different departments of the shops, April, 1907:

Locomotive Department

Shop:	At A.	At B.	At C.	At D.	At E.	At F.	At G.	At H.	At I.	At J.
Blacksmith .	40	25	93	57	55	58	41	28	25	15
Boiler	2	20	37	25	31	48	17	37	33	20
Carpenter ..	0	0	58	53	0	40	41	50	48	69
Erecting ...	50	6	93	66	44	99	39	48	40	0
Fitting	26	12	84	68	0	79	69	57	0	0
Machine ...	49	14	58	51	54	45	38	51	54	33
Paint	68	31	71	90	86	95	95	94	97	96
Tin	77	0	12	53	48	44	25	64	20	18
Tank	58	6	95	69	0	98	0	83	76	81
Foundry ...	0	36	0	0	0	90	0	0	0	0
Total	38	17	68	58	54	66	42	57	50	38

Average percentage of all shops, 52 per cent.

October, 1907.—Car Department.

	At A.	At B.	At C.	At D.	At E.	At F.	At G.	At H.	At I.	At J.
Blksmth shop.	64	0	0	18	0	0	49	0	0	0
Brass clean'g.	55	0	0	0	0	0	0	0	0	0
Freight rep'rs.	64	62	84	69	51	88	76	57	75	94
Machine shop.	25	0	0	0	0	86	58	0	0	83
Paint shop ..	99	38	0	0	0	81	84	100	0	98
Planing mill..	49	7	0	0	54	99	92	56	0	81
Pass. car shop	75	0	0	0	0	0	84	0	0	0
Pass. car clng.	68	0	0	0	0	0	0	0	0	0
Tin & pipe shp	72	53	0	0	0	0	94	0	81	0
Upholster shop	81	68	0	0	25	0	100	0	0	0
Average	68	54	84	62	51	88	77	57	75	93

Average percentage of all shops, 60 per cent.

The foregoing tables show that in the locomotive department a large percentage of all general repairs to locomotives in the different departments of the back shops is paid for by piece rates. Up to the date of the machinist strike we had a special man in each of our principal repair shops engaged in studying conditions, timing operations, making improvements, and recommending prices on operations not yet covered as fast as time and opportunity would permit.

The work in our pattern shops is paid for on a time basis because it is of such a diversified nature that it is difficult to make satisfactory piece prices. There is no doubt that these operations could be properly covered by fixed prices, but we thought it best first to take up lines of work which could be most easily covered by satisfactory rates.

In our roundhouses all skilled labor on actual running repairs is without any exception on a time basis, while wiping engines, cleaning roundhouse windows, dumping fires on engines, cleaning front ends, and shoveling cinders at clinker pit are entirely on a piece-work basis.

In our car shops, practically every class of work is covered by piece-work prices. We have some operations, of course, in every department of these shops that have not yet been timed and prices fixed, but up to the time of the present business depression we had special men in two of our large car shops who were timing operations and recommending a great many new prices.

On account of our shops being closed down most of the time in the last few months, this work is being neglected at present.

The locomotive shops at A, B and C had piece-work in effect in some of the departments as far back as fifteen years ago. There was also during this time some piece-work in the car department at our D and E repair shops.

It was not, however, until Sept. 1, 1904, that any special effort was made to follow a definite system of the introduction and management of piece-work in all the shops of this company.

At that time the following organization was put into effect

and the systematic introduction of piece-work was commenced in each of our shops in which equipment receives general repairs. This organization is effective in 21 shops.

PIECE-WORK ORGANIZATION.

(a) The Mechanical Superintendent, whose final approval of each price is necessary before it is put into effect.

(b) The Assistant Mechanical Superintendent in charge of shop work who approved all prices before they were submitted to the Mechanical Superintendent. This office, however, has since been abolished.

(c) The Shop Specialist or Piece-Work Expert who has general charge of making all schedules and putting into effect the piece-work prices in all the different shops along the line and who reports directly to the Mechanical Superintendent.

(d) The Master Mechanic of the shop, who passes on all prices before they are submitted to the Shop Specialist.

(e) The General Foreman of the shop, who personally signs all prices before they are submitted to the Master Mechanic.

(f) The Assistant to the General Foreman, who times all operations on which it is desired to make piece-work prices, giving in detail the time necessary to perform the operation, which if performed on a machine would include:

Time to get machine ready.	Time to set up work.
Time to take rough cut.	Time to take finish cut.
Time to remove work from machine.	Time to set and grind tools.
Kind of casting.	Kind of tool steel used.
Kind and number of machine.	Speed and feed.
Name of man performing work.	His day rate
Number of pieces machined.	Total cost per piece.

The piece-work price finally fixed for the work.

The workman must know in every instance that he is being timed for a piece-work price and he may also know, if he desires, the actual time that it took him to perform the operation and the piece-work price that is going to be recommended for same. He has a perfect right to raise a question at any time when he is performing an operation on which it is intended to fix a piece-work price.

(g) The piece-work checkers who are employed in the different departments check up the amount of piece-work performed by each man from day to day and make an accurate record of same on a blank card prepared for this purpose.

COMPARATIVE EFFICIENCY.

The following statement shows shop output and cost under piece-work as compared to day work:

The figures include all costs in connection with the piece-work organization, except the salary of the Shop Specialist and his office force, consisting at present of one man.

Statement Showing Cost of Engines Receiving General Repairs for the Year—January to December, inclusive—as Compared with Fiscal Year Ending June 30th, 1905.

	July to June, 1904-1905.				January to December, inclusive, 1906.			
	TBMF.	Cost.	TBM	Cost.	TBMF.	Cost.	TBM.	Cost.
Shop A.....	36	$39,661	27	$19,749	79	$63,243	8	$4,305
" B.....	130	160,417	51	35,485	207	193,280	7	3,729
" C.....	75	68,776	19	9,386	161	116,286	1	457
" D.....	113	113,293	4	1,394	198	173,612	4	1,659
" E.....	37	30,438	2	733	72	50,544	0	.....
" F.....	23	25,630	12	4,165	55	56,722	12	7,098
Totals...	414	$438.215	115	$71.912	772	$653,687	32	$17,248
Av'ge cost*.		$1,058.49		$625.32		$846.74		$539.00

*Per engine.

TBMF. = engines receiving general repairs to tires, boxes, flues and machinery.

TBM. = engines receiving all necessary repairs except flues.

Increase in shop output	52 per cent.
Saving per engines, TBMF. repairs 1906 over 1904-5	$211.75
Saving per engine, TBM. repairs 1906 over 1904-5	86.32
On this basis had the 772 engines in 1906 received TBMF. repairs under same conditions as existed in 1904-5, they would each have cost $211.75 more, or a total of	$163.470.00
If the 32 TBM. engines had been overhauled under conditions as cited above, they would each have cost $86.32 more, or a total of	2,762.24
Therefore, total net saving on engines receiving general repairs in 1906 is	$166,232.24

The year 1906 shows an increase in output over 1904-5 of 275 engines receiving general repairs and it is worthy of notice that but 32 engines received TBM repairs in 1906 as against 115 engines in 1904-5.

In other words in 1906 we gave practically all the engines that went through the back shop a thorough overhauling, thereby making them good for the maximum amount of service.

The normal output of our locomotive shops is about 1,000 general repair engines per year, and on this basis the above figures would show a saving of over $200,000.

EXPLANATION OF OUTPUT STATEMENT.

The fiscal year ending June 30, 1905, was selected to obtain figures for day work basis because the records containing present classification of repairs do not extend back further than July 1, 1904. Prior to that time, repairs were classified as either one, two, three or four, etc.

The year ending Dec. 31, 1906, was selected to obtain figures for piece-work basis because through all this time piece work in the shops named above was receiving the undivided attention of the back shop management.

We had an assistant to the General Foreman in each one of these shops who was devoting his entire time to studying the capacity of the machinery and putting into effect the best possible facilities for overhauling and putting the work up in place on the engine.

It is not claimed, of course, that piece-work is responsible for all the saving shown above. The new machinery, consisting principally of lathes, planers, boring mills, shapers, slotting machines, and such other machines as are used on the machine side of the back shop had a great deal to do with reducing the cost of output.

But in this connection, it is fair to assume that the large increase of output in the new machinery was much of it due to the fact that we were making a systematic study of this work and that when piece-work prices were once fixed the workmen were then required to perform the work in at least the fixed time in order to make their day rate, and when the earnings of the men were increased, the increase in output was, of course, in exactly the same proportion.

As one among hundreds of cases illustrating this fact we might cite the operation of boring tires on a new 90-in. Niles boring mill in Shop D. The machine had been run for some months on a day work basis with an output averaging about five tires per day of ten hours, day rate of workman 25 cents per hour, but the next day after a piece-work price of 17 cents per tire was fixed, the same workman bored 20 tires in ten hours, thereby increasing his earnings 36 per cent. while the capacity of the machine was increased 300 per cent.

It should be remembered also that in places like F, E and A very few improvements have been made in the boiler shop, blacksmith shop, tank shop, paint shop, carpenter shop, fitting department, tin and pipe shop and erecting shop. The improvements at these points consist chiefly of the new machinery placed on the machine side of the shop.

It is a fact, however, that the addition of pneumatic hammers, air hoists, special devices for handling certain classes of work in the departments enumerated above, some new furnaces in the blacksmith shops with a new steam hammer here and there and an occasional small power hammer, has added very much to increasing the output, but it must not be forgotten that new tools alone will add little to the output of any shop unless they are worked up to their capacity.

Piece-work benefits the employee by affording him an opportunity to increase his earnings, as illustrated in the following statement:

Gain Per Cent. Per Hour, by Piece-Work Over Day Work for All Machinists Working Piece-Work on the System, Month of January, 1907.

	Piece-work			Average rate	Gain,
	Total hours worked.	Total earnings.	Av'ge rate per hr.	per hr., day work.	per hr. p'ce wrk, per cent.
Shop A	7,028	$2,167.57	0.308	0.249	23.7
" B	2,436	723.72	.297	.244	21.7
" C	1,430	569.48	.390	.277	40.7
" D	2,059	782.49	.380	.278	36.7
" E	1,916	692.82	.361	.273	31.9
" F	3,881	1,414.77	.360	.254	41.7
" G	15,888	4,977.11	.313	.244	28.2
" H	9,969	3,931.07	.394	.261	50.9
Total	44,607	$15,259.03	0.342	0.259	33.0

We use the above rates, which apply to machinists only

because we had the figures at hand. The per cent. of gain to workmen in other departments is substantially the same.

The increase in shop output, as shown by a preceding table, is 52 per cent., while the increased earnings of the men amount to 33 per cent.

The month of January was selected because this usually is the coldest month in the year and if any difficulties could arise which would retard the speed of the workmen and decrease their earning power, they would show up at this time.

ATTITUDE OF THE MEN TOWARDS PIECE-WORK.

We do not believe our workmen as individuals are opposed to piece-work. It is only when we come in contact with the organizations to which some of our employees belong that we find an antagonistic feeling towards this method of shop organization.

This statement is proved to be true from the fact that since Sept. 1, 1904, when we first commenced to introduce piece-work in all shops along the line we have had no trouble whatever with our blacksmiths, boilermakers, tin and pipe fitters, tank men, painters and carpenters.

None of the above classes of labor have been organized within the time specified except the blacksmiths. This department had the remains of an organization when we commenced the introduction of the present piece-work system, but as the piece-work went into effect, the organization gradually went out of business.

ORGANIZATION'S OBJECTIONS TO PIECE-WORK.

The Machinists' Union objects to piece-work because, as it claims, it puts one man against another, father against son, and son against father in the scramble to increase their daily earnings.

As a matter of fact, it simply places every man, regardless of relation, on his own merits. When the piece-work price is once fairly established, it presents to all alike an equal opportunity to increase their daily earnings in direct proportion to the effort.

Labor organizations always have maintained that a uniform day rate should prevail for each individual class of mechanics. Piece-work, of course, is diametrically opposed to this proposition, because it fixes a fair price on the individual operation and then leaves it open for each workman to earn wages in proportion to his ability.

The foregoing tables clearly demonstrate this fact, because while the piece-work prices are practically the same and in many respects the conditions are the same, a study of the figures will show that some shops earn much more than others on the same class of work. This is directly due to the intelligence, mechanical ability and efforts of the workmen.

The principal effect, however, of a piece-work organization is that it reduces to a minimum the number of mechanics required in the different departments of the shop, because the number of men must be reduced in direct proportion to the increase in efficiency of each individual mechanic.

It is a self-evident fact, however, that the more mechanics a shop employs in a certain line of work, the more money there is in it for the labor organizations, and it is therefore to their interest to maintain a stubborn fight against the further introduction of a fixed price for a given amount of work.

On * * * * our machinists struck to abolish piece-work, but we believe that outside influences, or in other words, the influence of the international officials of the Machinists' Union provoked the strike, rather than individual grievances among our men.

It is known that James O'Connell, President of the International Association of Machinists, at their last biennial conference made the statement that unless same immediate force could be brought against the piece-work system which would put it out of business in railroad shops, his organization would be obliged to give up the fight, and it was practically decided at that meeting that one of the large railroad systems would be selected on which to make this fight.

In looking about for a victim, they selected the A. & B. Railroad because it had gone further into the details of piece-work than any other system at that time, and because they thought the road was also not in a position financially to withstand the effect of a prolonged machinists' strike.

The A. & B. Railroad was, therefore, selected as the ground upon which the organization would stand or fall on the question of piece work for these two specific reasons:

First.—Because we had a thorough organization and were following the work systematically in every detail.

Second.—Because the Machinists' Union thought we were financially poor.

We had never, in the past, made any unsuccessful attempts to put labor on a piece-work basis.

COMMENT.

Almost every corporate business of any magnitude at the present time is conducted on a contract or piece basis of one kind or another, the principle of all being the same; a fixed price for a given amount of work.

The private locomotive concerns, the Bethlehem and Midvale Steel Companies, the plants of the United States Steel Corporation, the General, Central, Western and all other electrical companies, the Westinghouse and New York Air-Brake companies, the iron foundries, the tin pail, textile and boot and shoe industries, and hundreds of others which might be named are working undisturbed on a piece or contract basis of some kind.

The labor organizations interested in these concerns often raise the question of rates but they do not question the right of the corporation to apply the contract or piece-work principle to increase the output of the plant.

We believe that at the present time if a fixed policy with reference to piece-work could be outlined by the heads of the principal railroads and given into the hands of the officers of the mechanical department, to be put gradually into effect, substantial progress could be made in this work within the next two or three years.

The present business depression affords a very opportune time to adopt piece-work methods and if allowed to pass unimproved it is doubtful whether the same advantage will be offered again for years to come.

The workmen in our own shops are well satisfied and in fact, on account of short hours, glad of the privilege to get piece-work prices, as this affords them an opportunity to increase their earnings.

Some of the striking machinists who have returned to work have asked to be put back again on the old prices. But by far the strongest argument in favor of piece-work from an economical standpoint is the fact that each shop turns out the maximum output.

The foregoing figures show an increase in output of 275 engines per year, which is approximately 23 engines per month.

If we can turn out one general repair engine per month for each erecting pit in the shop (and it requires an up-to-date shop, equipped with all modern facilities, to maintain this average) the above increase in output would require a new shop of 23 erecting pits which, figured at a total cost of $60,000 per pit for buildings and all equipment ready to operate, would necessitate an expenditure of $1,380,000.

To this should be added the necessary cost for power to operate the new plant, supervision and all other incidental expenses which would amount to many thousands of dollars per month.

German railroads in April and May earned about 3¼ per cent, less this year than last. The Prussian State Railroads, which are the chief coal carriers and most affected by the iron industry, earned 1⅞ per cent. less than last year in these two months. In the first half of June the coal mines required an average of 32,153 cars (11 tons) per day, against 32,522 last year.

PNEUMATIC CAISSONS.

BY T. KENNARD THOMSON.

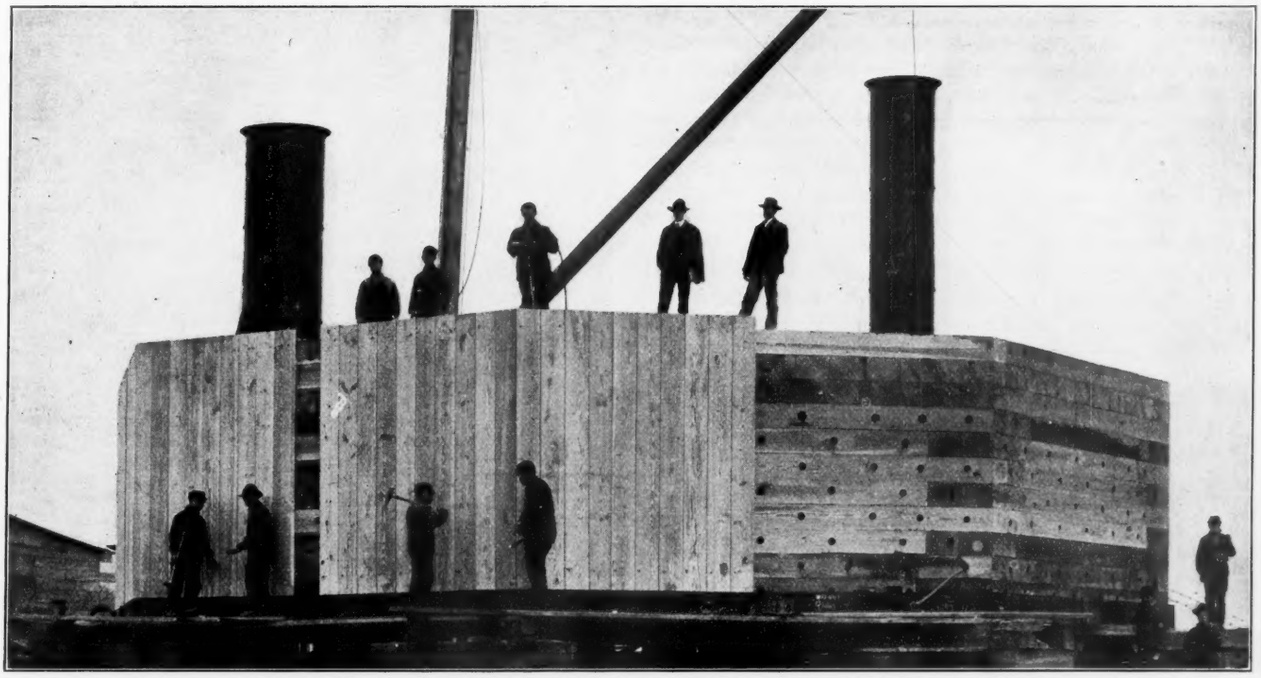
II.

River caissons are usually built either on the shore and skidded or launched into the river, or else they are built on a pontoon, made of two or more parts bolted together. A pontoon is usually made by spacing 12 x 12 in. timbers about 3 or 4 ft. apart and spiking 3-in. plank on the bottom and then building side walls of 3-in. plank about 6 ft. high, the bottom and sides being well calked with oakum, giving a dry platform to build and calk the caisson on. We usually build the sides of the caisson about 14 ft. high above the cutting edge, when we expect the caisson to draw 8 or 9 ft. of water after the pontoon has been removed. But before this is done it is necessary to attach the bottom sections of the excavating and main shafts as well as all air and blow pipes, and gas pipes for electric wires and whistles.

The method usually adopted for removing the pontoon from under the caisson is to weight the center of the pontoon with gravel or stones and remove the bolts which connect the two halves together, and then flood the pontoon by opening a valve or two, which allows the caisson to float and removes the weight of the caisson from the pontoon. The pontoon then acts up against the caisson according to the displacement of the pontoon when submerged, itself, instead of according to the much greater displacement of the caisson. If sufficient weight has been placed on the pontoon, each half will often shoot from under the caisson as it sinks. At other times it is necessary to attach tugs to pull the pontoon sections away, or to rig up a few struts with block and tackle connected to a hoisting so arranged as to force the parts of the pontoon under the caisson down and out. While this is generally the operation of a few minutes, it is often bungled, and it once took several weeks, first because a green man tried to pull the pontoon away without sinking—thus pulling against the entire weight of the caisson, and second, because he allowed enough water to get in to freeze the caisson to the pontoon, and then sank them frozen together—a very expensive lesson.

The pontoon can, of course, be used over and over again, in fact, as often as there are caissons on the job, unless time is an object, when it will often pay to build two pontoons. Caissons from 60 to 100 ft. long will often take three or four weeks to build, if built by an expert, before they are ready to launch, which is a serious amount of time if 10 or 12 caissons are to be sunk in one season.

Caisson work in winter always costs more than if done in the summer, owing to the extra consumption of coal, trouble of packing air pipes to prevent freezing, to say nothing of the danger of ice and floods. Sometimes in silty rivers where if a channel was dredged to float the caisson it would fill up at once with silt, it is necessary to build the caisson on a platform supported by piles at the site where it is to be sunk and to attach a dozen or so rods about 2 or 3 in. diameter to the cutting edge. The rods being threaded for most of their length and pass through plates held on frames around the caisson in such a way that when the caisson is completed it can be hung from these rods. By turning the nuts on the rods simultaneously the caisson can be lowered until it floats or until the resistance under the cutting edge is sufficient to support the caisson while the cofferdam is being placed on top. The rods are so arranged that as soon as the caisson is landed they can be disconnected and used over again for the next caisson. A caisson can usually be lowered in less than a day by this means, so the expense is not very serious.



Building Caisson for Pivot Pier; Fordham Heights, Harlem River Bridge.

It is very important to see that the site for the caisson is level before putting the caisson in position, and if it is not it should be dredged as nearly level as possible, otherwise the caisson will be thrown out of plumb and probably warped at the outset, and then will cause trouble all the way down.

The expedient of dumping material in the low shots to level up is a very poor one, as the dumped material will not give nearly as much resistance to the cutting edge as the original surface, and distortion will probably occur. It is an exceedingly difficult matter to handle a warped caisson, and once a caisson is warped it is almost impossible to level it up again. As a caisson which does not start right in this respect seldom finishes right, half the battle is in the start.

Caissons sunk on land are held in place by shoring against

any available structure until the cutting edge has penetrated sufficiently far to prevent loss of control. In a recent New York city job the concrete caisson standing 20 ft. in the air was insufficiently shored up, with the result that it fell over —a total wreck—costing the contractors several thousand dollars.

In river caissons clusters of piles are usually driven, when possible, near the four corners about 5 ft. or so away from the caisson, and a guide frame is placed between these piles and the caisson. These piles also serve to attach the sand hog boat house, the derrick boats, as well as scows of sand, stone and cement—making quite a cluster of necessary boats. The derrick boat often carries a 2-cu. yd. concrete mixer with hoppers or bins above to hold the sand, stone and cement, and should have at least two booms, one for unloading the material from the scows, using a clam-shell bucket for the sand and stone; and one to handle the concrete bucket, and when necessary the cofferdam material.

In many cases where the material is "blown out" it can be excavated faster than the cofferdam can be built and calked, so it would sometimes pay to have a separate derrick for building the cofferdam. This rapidity of sinking could not be obtained if the material were excavated by means of buckets, and if the material is to be so handled it would be economy to have a shaft for every 25 lineal feet of caisson length, and even if the material is to be blown out it would pay to have frequent shafts for economy in handling the concrete. But contractors will not as a rule put in so many shafts, for even if the caisson is 130 ft. long, they will probably not use more than two excavating shafts and one main shaft—the latter also being used at the end for concreting the working chamber.

The pipes for supplying the compressed air are generally 4 in. diameter, and there should be at least two from the deck to the top to facilitate changing the connection, etc., as the cofferdam is added to. One 4-in. line is sufficient from the caisson to the compression plant, with smaller pipes for high pressure to operate the locks. In winter it is necessary to place these in a box filled with manure, for I do not know of anything that will freeze quicker than a compressed air pipe.

The compressor plant with electric lighting and pumping plants is sometimes compactly arranged on a big float, though it often pays to place the entire plant on shore alongside of a railroad track on account of coal, etc.

In many cases we find an existing bridge parallel to the bridge under construction where the pipes find plenty of points of support, and in other places a light trestle is built or the piles can be laid directly on the bottom of the river, which, however, is not so desirable.

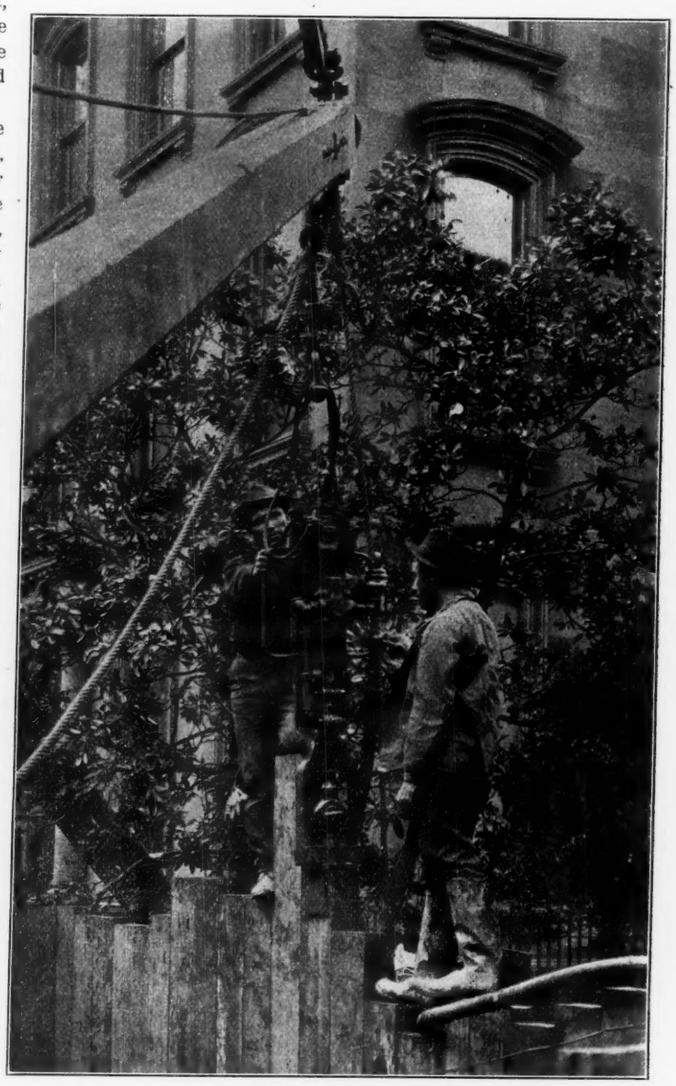
It is impossible to lay down any cast-iron rule for the size of the plant required, for it will depend not only on the number of caissons to be sunk at the same time, but also on the time of year or climatic conditions. It always pays, however, to have plenty of boiler capacity, say, for a fair-sized bridge, two boilers of 150 h.p. capacity each, or four of 80 h.p. each, while there should always be at least one more compressor than is actually required for the work, to allow for repairs, etc., which are sure to be needed. A work of this magnitude would probably require three or four compressors aggregating from 2,500 to 3,000 cu. ft. of free air per minute.

Nothing is so expensive on contract work as delay.

The Ingersoll-Rand straight line compressors and the compressors of the Norwalk Company are among the best in the United States.

Reference has been made to the effect of the weather and locality on the cost of caisson work as regards coal, etc., and I may give two examples, in both of which the work took about one year, winter and summer. The first case was in the East, where there were some 20 medium-sized river caissons using 5,000 tons of coal at $3, making the total cost of coal about $15,000. The second was in the West, and though there were only about one-half as many caissons and the total cubic yards of caisson work was only about one-half in the western bridge than in the eastern one, the amount of coal, owing to the severe weather, was the same, while the price was $8 a ton, making the total cost of coal $40,000, which made the coal in the second bridge cost over five times as much per cubic yard of caisson work for the western bridge as it did for the eastern one, although both were handled by the same contractor, with the same plant and same staff. This is one of the reasons why it is so hard to figure the cost of pneumatic work in advance.

One of the best money-saving devices for a contractor who has a number of caissons to build is a saw arbor run by compressed air or electricity. The saving in time in cutting the 12 x 12 timber to the right length, as well as the smaller sizes, pays for the machine in a very short time.



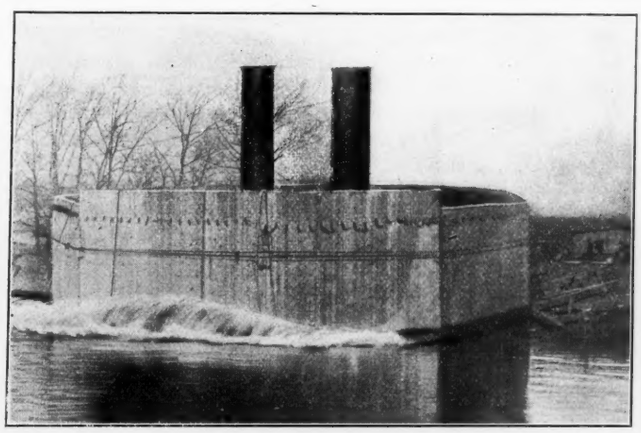
Ingersoll-Rand Drill Used as a Pile Driver.

A really good pipe-cutting machine with dies, etc., is also indispensable, as also are pneumatically run augers for boring holes for bolts and drift bolts, and a pneumatic hammer for driving the same. An ample number of the best stiff leg and guy derricks and necessary side tracks, wharves, cement and other buildings will well pay for the outlay, large though it is.

Pneumatic caisson work is sometimes contracted for at below $20 per cubic yard, but there are not many places

where a contractor can take the work at this figure and complete his undertaking except at a loss, while in some places the cost runs up to $40 or $50 per cubic yard. As a general rule the cost of caisson work per cubic yard for the foundation of New York skyscrapers is about double what the pneumatic work for a fair-sized bridge outside of the city would cost.

The only proper way to light the air chamber now is by



Launching a Caisson.

electricity, so where current cannot be purchased readily it is necessary to install a good electric light plant.

Telephone connection from the working chamber is also useful, and in some emergency cases would be invaluable in saving life and property. One of the most unpleasant accidents is to have the bucket stuck in the shaft when the caisson has only one shaft and lock for men and material. This has frequently happened, keeping the men in the air from 10 to 12 hours overtime, sometimes with very dangerous results, for the men have used up their energy and have no food to replenish with, and are, besides, nervous about the outcome—a very disagreeable combination, to say the least, especially as half the time they do not know what has happened, or what is being done to get them out. As an example, last summer the door of the lock got "jammed" and the men in the working chamber kept "rapping" and blowing the whistle (five times) signifying that they wanted to come out. At first the men outside answered back with two raps, which means "hold" or "you will have to wait," but after a while the outside men who were working over the lock got tired of answering, so the sand hogs stopped signaling; and after quite a long silence the outside men signaled below repeatedly without getting any answer whatever, and becoming alarmed for fear that the sand hogs were paralyzed, they took the bull by the horns and took the whole lock off, allowing the surrounding material to enter the working chamber. The minute the lock was off the sand hogs, who had purposely refused to answer the signals, clambered up the ladder and went home. This paper could be filled with equally exciting experiences.

The men who work in the air chamber, better known as sand hogs, are a hardy, reckless set. Until a few years ago they only received $2.50 per day of 8 hours in New York city for pressure up to about 20 lbs. per sq. in. above atmospheric, the price rapidly increasing above that as the pressure increased and the hours of labor decreased, until at about 45 lbs. per sq. in. they only labored 1½ hours per day, and even that was divided into two shifts of three-quarters of an hour each, with a rest of four hours in between. Very few fatalities occur in the lower pressure and long hours, but many occur when the pressure is over 40 lbs. per sq. in.

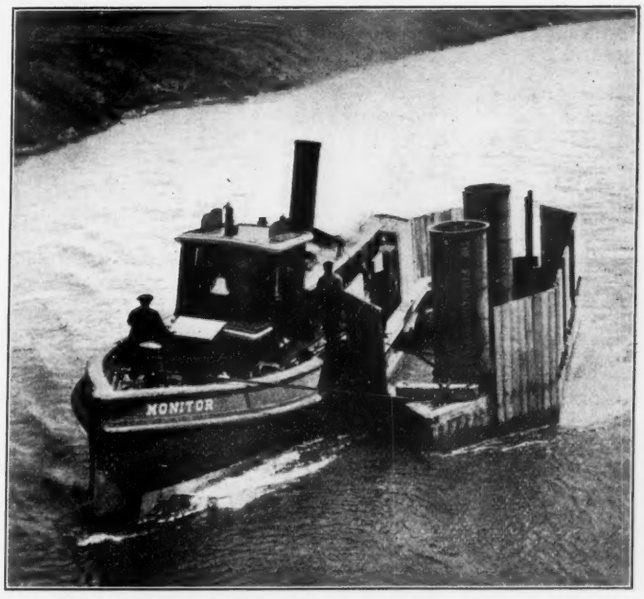
Now, however, the unions have raised the lowest figure to $3.50 a day, the actual working time being 7½ hours with ½ hour for lunch. This requires three shifts a day: from midnight to 8 a.m., from 8 a.m. to 4 p.m., and then to midnight, for once the compressed air is in the working chamber work should not stop until the excavation is completed and the air chamber filled with concrete. For not only do stoppages increase the friction on the sides, but there is always a danger of accidents if there is no one in the air chamber but a watchman, since both the watchman and the gage tender outside are liable to go to sleep, and they have often done so, allowing the pressure to either go up too high and blow out or fall too low and draw the material in, sometimes allowing the caisson to sink until the working chamber is completely filled with material, which is removed with difficulty.

While the hours laid down by the unions are supposed to be all that the men can ordinarily stand, nevertheless, by taking care of themselves they have occasionally worked more than twice as long, but not continuously, day after day.

While watching a certain piece of work I went in and out of the air chamber for 86 hours without going to bed, and that, too, in pressures up to 35 lbs. per sq. in. above atmospheric. But I have had the bends twice, and do not propose to take the risk again, even though I only stay down a few minutes at a time.

The best sand hogs are Irish and Swedes, two classes that do not like each other very much, calling one another "square" and "round" heads. I have also had some very good colored men. Italians as a rule do not care for the work. Sand hogs cannot be classed under the head of skilled labor, which is the reason why the men are not better paid, for all that is needed is a good constitution and plenty of pluck. With these two qualities the ordinary sand hog can learn all he needs to know in a day, and he will do a big day's work when in the air chamber, using or burning up his energy, which likewise gives him a big appetite, so that we seldom see a lean sand hog, nor do we often see an old one.

The foremen and superintendents, however, need years of



Towing a Caisson to Position.

experience and the ability to act quickly and fearlessly in emergencies, lack of which qualities have been fraught with disastrous results to life and property. For instance, in excavating it is customary to dig down in the center about a foot or two at a time, leaving a small bench around the cutting edge and then removing this just before they are ready to let the caisson "drop," which is often accomplished by lowering the air pressure for a few moments. Now a good

foreman will see that he gets an accurate report from the engineers at least twice a day, preferably just before 8 a.m. and 4 p.m., giving the exact position of each of the four corners as regards elevation and location, from which he will determine how much to throw the caisson by undermining one side more than the other, etc., and thus prevent the caisson getting away from him. For after a caisson has penetrated more than 25 to 30 ft. it is often not only impossible to get it back into its proper position, but it is also impossible to prevent it from getting more and more out with every foot of penetration, so that the utmost care and vigilance is required at the start.

A foreman who tries to keep his caisson right by means of a plumb bob or hand level, instead of from levels furnished by the engineers, will find it impossible to keep his caissons vertical and will be very much astonished to find how much he will be out of line and level.

Many accidents have happened to caissons which a little foresight would have avoided, as in numerous cases where the weight has been taken off, or not enough has been added to allow for the rising tide, with the result that the caisson almost completed, has broken away from its bed and risen enough to necessitate its being completely wrecked.

In 1901 a break occurred in the intake caisson for the new Cincinnati waterworks. This was a very expensively designed caisson and one that the writer would not recommend being copied. The following report of the accident was furnished to the *Engineering News* by the chief engineer of the works at that time:

"The pump pit is on level ground, about 200 ft. from the top of the river bank, and about 1,400 ft. from the channel where the intake pier is located. The caisson rests on clean sand saturated with water, the shoe being at an elevation about 15 ft. below the lowest point in the channel. The chambers of the caisson were filled with the same sharp sand in October, 1899, at a time when the river being low the air pressure required to keep water out of the working chambers was only about 15 lbs. per sq. in., which pressure was in a large measure counterbalanced by the weight of the sand ballast placed on the deck during the sinking process.

"The shaft connecting the pump pit with the tunnel was sunk immediately after the chambers had been filled; the portion of the shaft between the caisson and the rock being a cylindrical steel shell, lined internally with concrete and brick in Portland cement, and the same lining extending through the rock to the tunnel.

"This brick lining was built in November and the beginning of December, 1899, also a period of low water. The first high water after construction of the pit and shaft occurred on December 26, 1899. It reached 25.2 ft. above datum. At the date mentioned an open seam in the brick lining of the shaft made its appearance, which was readily repaired by an injection of Portland cement mortar under compressed air.

"On January 26, 1900, a second freshet in the river to elevation 34.6 ft. was attended with the same effect. A seam appeared again at the same place, and was repaired again in the same manner.

"On the occasion of a third rise, on November 30, 1900, elevation 42.3 ft., the same thing occurred again, but this time the seam showed itself about 10 ft. below the first crack. In the meantime levels taken on the deck of the caisson from time to time had shown a deflection upward co-incident with each period of high water. These deflections were permanent, indicating that the land had followed the roof of the chamber. It is quite evident that the open seams in the brick lining have been caused by the deflection of the caisson deck carrying with it the steel shell and part of the brick work below it, and that the same phenomena will repeat itself with every stage of water higher than those preceding them since the execution of the work and until a sufficient weight has been placed on the deck to neutralize the effect of the highest water. For this reason it was decided not to repair the last crack until the pumping engines have been placed on the deck, as the weight of these engines will be equivalent to that of 25 ft. of water in the pit, and as the last high water (elevation 59.6 ft.) was only 11.4 ft. below the highest water on record, we will then be secure against any further deflection of the deck.

"There is, in fact, no necessity for filling this crack other than the desirability of having a water-tight shaft on the rare occasions when the tunnel will be pumped out for examination."

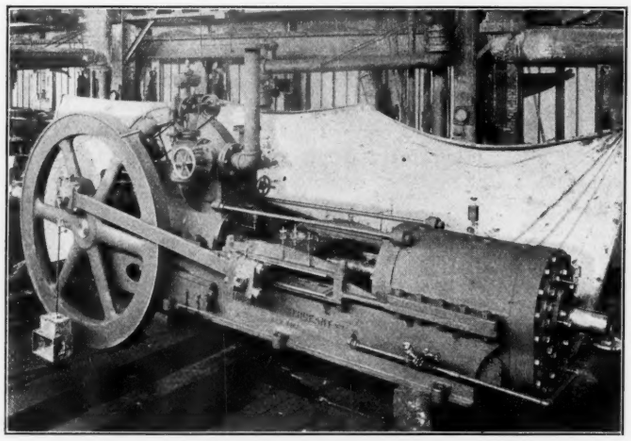
To be fair, the above report has been copied word for word. Obviously the caisson should have been designed so that it would always be heavy enough to stay down, and this could advantageously have been accomplished by using less wood and more concrete. In fact, the design of this caisson made it an exceedingly expensive one to build, having a timber roof or deck 10 or 12 ft. deep, and of oak, too, yet in spite of this excessive thickness the above report shows that the roof deflected upward. By using a modern thin (say 3 or 4 ft. thick) yellow pine roof, and by using more concrete, the caisson would have been heavy enough to withstand the water pressure, especially if the working chamber had been filled with concrete instead of with sand.

In 1901, in sinking a crib for the Cleveland waterworks in Lake Erie, a steel working shaft 11 ft. in diameter was used. The shaft was attached to the bottom of the caisson about 80 ft. from the top, or at about the level of the bottom of the lake, and then extended downward for some 40 ft. more.

During construction the air pressure was from 25 to 30 lbs. per sq. in., but at the time of the accident the pressure was supposed to be less.

Without warning the shaft broke in two at a point just above the bottom of the lake, where it was rigidly attached to the caisson, and the upper 80 ft. shot up into the air, and in falling fell against the side of the crib, being too long to fall flat, which fact permitted the men to be taken out of the shaft uninjured—one man lost his life by falling down the shaft and four who were working below were drowned.

The fact that the shaft broke at what was apparently the bottom of the unsupported length, where the cantilever strain would be the greatest, would make it appear to be the result



Ingersoll-Sergeant Class A Compressor.

of a blow at the top, though a heavy wind storm might have had the same effect, and yet there were plenty of means at hand to have braced the shaft properly at little expense.

It is often difficult to make the men put in all the bolts in the flange connections and to see that they are all tightened up. Of course if a few bolts were missing and a slight blow was received at the top of the shaft, aided by a heavy wind, the accident could be easily accounted for.

There have been many causes for many kinds of caisson accidents, most of which could have been prevented with care. For instance, a large iron caisson broke loose off the coast of Nova Scotia and was carried out to sea, where it sank and was never heard of again.

In New York city most of the accidents have caused damage to the adjoining property, as well as to the caissons themselves, where by careless slacking of air, etc., material has been drawn from under the adjacent buildings, very badly wrecking them.

In one case the contractor or owner decided to save money by not using compressed air at all, and tried to sink five open cofferdams alongside of a 20-story, nearly completed building, with the result that the building was undermined and was thrown 18 in. out of plumb. It was necessary to take out all the terra cotta floors and get a good firm of iron contractors to jack the steel work back to place. Needless to

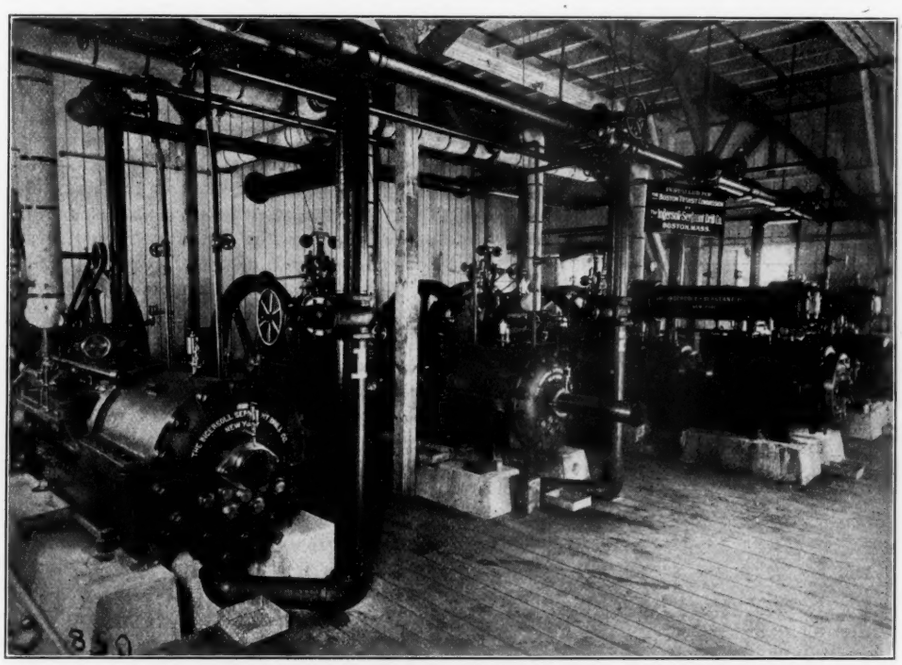
say, this cost more than good pneumatic caissons would have cost in the first place.

CAISSON DISEASE.

When a novice enters an air lock the pressure is, of course, at atmospheric, and as soon as the outer door is shut (it is usually held shut by the pressure of the air), the pressure is gradually increased; but no matter how slowly it is increased one has, at first, more or less trouble in equalizing the pressure on both sides of the ear drums. This is usually accomplished by closing the nostrils with a finger and thumb and then blowing the air through the throat into the ear passages. Sometimes beginners cannot do this, and occasionally even an old-timer will get caught this way if he happens to have a bad cold.

The result of getting "blocked" is that one or both ear drums may be ruptured, causing intense pain, or some blood vessel in the head may burst.

The most common complaint is known as the "bends,"



Ingersoll-Sergeant Class A and Class A C Compressors.

which only attacks one after leaving the caisson, sometimes several hours after, and thus tends to bear out the theory that caisson disease is caused by the air forcing the blood away from the surface and the bubbles of air remaining in the system when the person has left the air chamber too quickly.

The bends generally attack the arms or legs, and sometimes the lower part of the body, causing more or less intense neuralgic pains or cramps, which are said to resemble rheumatism, but to be worse. Yet, in spite of the intense pain and suffering, they rarely result in death.

The worse effect, however, is paralysis, which attacks the limbs or body, though generally the legs or lower part of the body. Sometimes the victim becomes paralyzed on the whole of one side. This trouble also, as a rule, attacks the unfortunate man shortly after he has left the compressed air, though sometimes not for several hours after. It is very rare for a man to be paralyzed while in the air chamber, though some have been killed the first time they have entered, and before they could get out.

Occasionally an old-timer, who has always considered himself immune, has been bowled over. When paralyzed, some completely recover after a few hours' treatment; some remain partly maimed for life, while others succumb sooner or later. Some experienced men claim that they can tell when they are going to get the bends or be paralyzed while still under compression, in spite of the assertion of other writers and experimenters that all forms of caisson disease are contracted during decompression.

Forty-five or 50 lbs. above atmospheric is about the limit in which men have performed actual work, and these high pressures are always attended with great risk and loss of life.

French experimenters have shown that these pressures might be more than doubled safely, under ideal conditions; which, however, have not yet been attained in actual work. One of the chief conditions for thus working under a head of 200 ft. depth is very slow decompression, but it is doubtful if men could do much work under such pressure without running too great a risk.

Dr. Jaminet, one of the earliest to write on caisson disease, being the medical expert of the Eads bridge of St. Louis in 1871, came to the conclusion that caisson disease was simply the result of exhaustion from too rapid a tissue change caused by the absorption of excess of oxygen. His remedy consisted of a complete rest, with feet in an elevated position, and a supply of stimulants and nourishment.

A second theory, advanced by Dr. Andrew H. Smith, the surgeon in charge of the caisson work for the New York towers of the Brooklyn bridge, was that the superficial pressure of the air upon the body acts to force the blood from the surface to the center, causing internal congestion. The more rapidly one enters and the longer one stays in compression, the worse this congestion, and the more rapidly one leaves the compression, the greater the danger of the blood not returning to its proper distribution, leaving more or less bubbles of air in the system and causing the bends.

A third theory is given by Dr. Wainwright, of the Waterloo & City Railway, London, and is to the effect that the blood and viscera absorb oxygen, nitrogen and carbonic acid —particularly the latter—and that the physiological result of the carbonic acid gas and the mechanical action of all three gases in escaping through the tissues upon the release of pressure cause the bends.

I am inclined to think that there is much in all of these theories, and can set down established facts as follows:

1. The more rapidly one enters the higher pressures, the more rapidly the blood is forced from the surface, and the greater is the risk of bursting blood vessels in the head or of fracturing ear drums.

2. The longer one stays in compression and the more work that is done, the greater the danger of being paralyzed or of getting the bends.

3. The quicker the pressure is reduced on leaving the caisson, the greater the danger.

4. I have known many cases where foul air did more damage than fresh air at a much higher pressure. Undoubtedly tallow candles in the early caissons, and gas in the Brooklyn bridge caissons, did much to knock the men out.

5. It is very dangerous to enter a compressed air chamber with an empty stomach.

6. It is advisable to put on warm clothing and take hot coffee on coming out if there is any danger of getting chilled.

7. The more energy expended in compression, the greater the danger. We know that the excess of oxygen in the com-

pressed air renders the men very much more active than when in ordinary atmosphere, with a consequently greater fatigue.

8. It is suicidal for anyone with weak lungs, heart or nerves to enter the lock.

9. Even healthy people cannot be sure what effect compression will have on them until they try it.

10. The most reliable remedy is recompression in a hospital lock.

11. Electrical treatment is sometimes efficacious.

12. Most important of all, as much time as possible should be taken in decompression—the more, the safer.

Mr. Hersant, of the Bordeaux harbor works in France, made some very interesting experiments in 1895, in which he kept a man in a pressure of 768 lbs. per sq. in. for one hour, taking 45 minutes to reach this pressure and three hours to reduce it.

From the result of experiments, the French doctors have suggested allowing 20 minutes for each 15 lbs. of pressure for compression and decompression, which would be very hard to enforce for low pressures, as men are accustomed to only take five minutes, or even much less, to enter or leave caissons under pressure up to 30 lbs. per sq. in., in addition to atmospheric.

The risk increases so rapidly for every pound over 30 lbs. that men are more cautious as the pressure approaches 45 lbs.

Another authority recommends 4 minutes for each atmosphere (15 lbs.) for decompression below three atmospheres, and 10 minutes for each additional atmosphere above three atmospheres (45 lbs.), but it is safer to stay out of anything above three atmospheres in addition to the normal.

I know from experience that the same remedy will not always have the same effect even on the same man; for instance, after suffering from the bends for several hours, I found that a hot cup of coffee produced a profuse perspiration and relieved the pain, which, however, quickly returned; so a very hot bath was tried, which also banished the pain until the bath room was left behind. Then complete relief was obtained from a few mild electric shocks. The second time I experienced the bends, a bee-line was made for the electric battery, which, however, did no good.

The first attack mentioned was in the leg and I noticed that every additional trip into the lock made the attack more severe; but on the second occasion, the attack this time being in the arm, it was found that by going in and out frequently but very slowly, the pain was reduced each time until it vanished.

Similar experiences make many think that they must "grin and bear it." But recompression in a hospital lock is now considered imperative.

In both of the above cases the pressure did not exceed 25 lbs. per sq. in., and yet I have experienced 35 lbs. many times, and 45 lbs. occasionally, without any ill effects. Like all diseases, a man is immune some days and liable to contract the ailment on others—and he can't tell which day is which!

In sinking caissons in the Harlem river we found that men suffered severely from the bends while passing through the foul silt and just below the bottom of the river, and that when this material had been passed through and the caisson had entered the clean (no sewage mixture) clay the trouble with the bends disappeared, although the pressure was necessarily very much greater.

In excavating there is always considerable escape of air under the cutting edge, etc., which, of course, has to be replaced by fresh compressed air which keeps the atmosphere in the working chamber in a fairly good condition; whereas, when concreting, after the concrete has covered the bottom above the cutting edge the loss of air is very much less, and hence less fresh air is received from the compressor, and the air becomes more and more contaminated as the concrete proceeds and the working chamber contracts, with greater danger of the bends and paralysis. Sometimes old-timers have gone in to uncouple the bolts in the upper sections of the shaft and in a short time have been taken out dead.

In one case, a rubber pipe caught fire and the compressor pumped the stifling fumes of burnt rubber into the working chamber, from which the men were with difficulty rescued.

When blasting in the working chamber, it is usual for the men to go out; but in one case where the working chamber consisted of several compartments the men walked into an adjoining compartment, out of the reach of any flying stones, etc., and after one of the discharges, one of their number was taken out dead.

COMPENSATED LOCOMOTIVES.*

BY HERBERT T. WALKER.

I.

Now that the four-cylinder balanced locomotive is coming into general use, and it would appear that an effort is being made to build a reciprocating engine with a torque and absence of vibration approaching that of the steam turbine or electric motor, the student of locomotive history will naturally recall the designs of some of the early engineers to solve problems that became manifest as far back as the days of George and Robert Stephenson, when their engines, with those of their contemporaries, were, by growing competition, required to travel at comparatively high velocities.

With few exceptions, the original outside cylinder engines were fairly steady at moderate speeds, in spite of the fact that they were not counterbalanced, but as speeds were increased and working parts made heavier, some surprising and dangerous movements of the engine soon developed, which confounded our mechanical predecessors and called for immediate and close study—for at that time the behavior of unbalanced revolving and reciprocating masses was imperfectly understood, it being generally believed that the alternate action of the steam on the cylinder covers was wholly accountable for unsteady motion, and there being no known remedy for the evil, matters were allowed to take their course, until at last certain outside cylinder engines on being urged a little beyond the usual speed, made a vigorous protest by actually throwing themselves off the track, and the engine drivers declined to run them. The erratic movements of early locomotives became so marked that the British government had to take cognizance thereof, and Major-General Pasley, Inspector-General of Railways, sharply criticized them, affirming that their oscillation was positively alarming, and that something would have to be done in the matter. It was found that outside connected engines with outside frames were the most vicious of all, and this led to the deduction that the more closely the cylinders could be placed together about the center line of the engine, the steadier the engine would run. The truth of this having been established by practice, an additional advantage of the inside cylinder engine was found to arise from the fact that the cylinders could be kept at a higher temperature inside the smokebox than outside, which meant an economy of fuel—always a matter of prime importance to British engineers. For these reasons the cranked axle and inside cylinders came to be standard in British practice, and a solution of the counterbalancing problem was thus postponed for a little season.

But even with inside cylinders the ever-increasing speeds soon gave more trouble, and it gradually became apparent that when a weight was placed in the driving wheel in opposition to the crank, it tended to relieve at least one of the mysterious and destructive motions of a locomotive engine. This led to the employment of the driving wheel counterbalance

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as we have it to-day, but who invented it—if, indeed, it may be considered an invention to balance one weight by the introduction of another—is uncertain. It is also doubtful when counterbalances were first used in locomotive driving wheels, and it is probable that the date will ever remain hidden, for a reason that is not generally known. We know for certain that Rogers' "Sandusky" of 1837 was provided with balance weights in the driving wheels, and that they were used by Roberts and by Braithwaite in England in the same year, but drawings and engravings of old British locomotives cannct be relied on in this regard, for balance weights were not always shown by the artistic mechanical draftsmen of the past, whose refined sense prompted them to omit these excrescenses (held to mar the beauty of the driving wheel circle) from their elaborate and highly-finished longitudinal elevations. This idiosyncrasy on the part of the old "Knights of the T-square" has now made it difficult to fix the date with any certainty, for drawings of some British engines known to have been built with balance weights as late as 1840 do not show them.

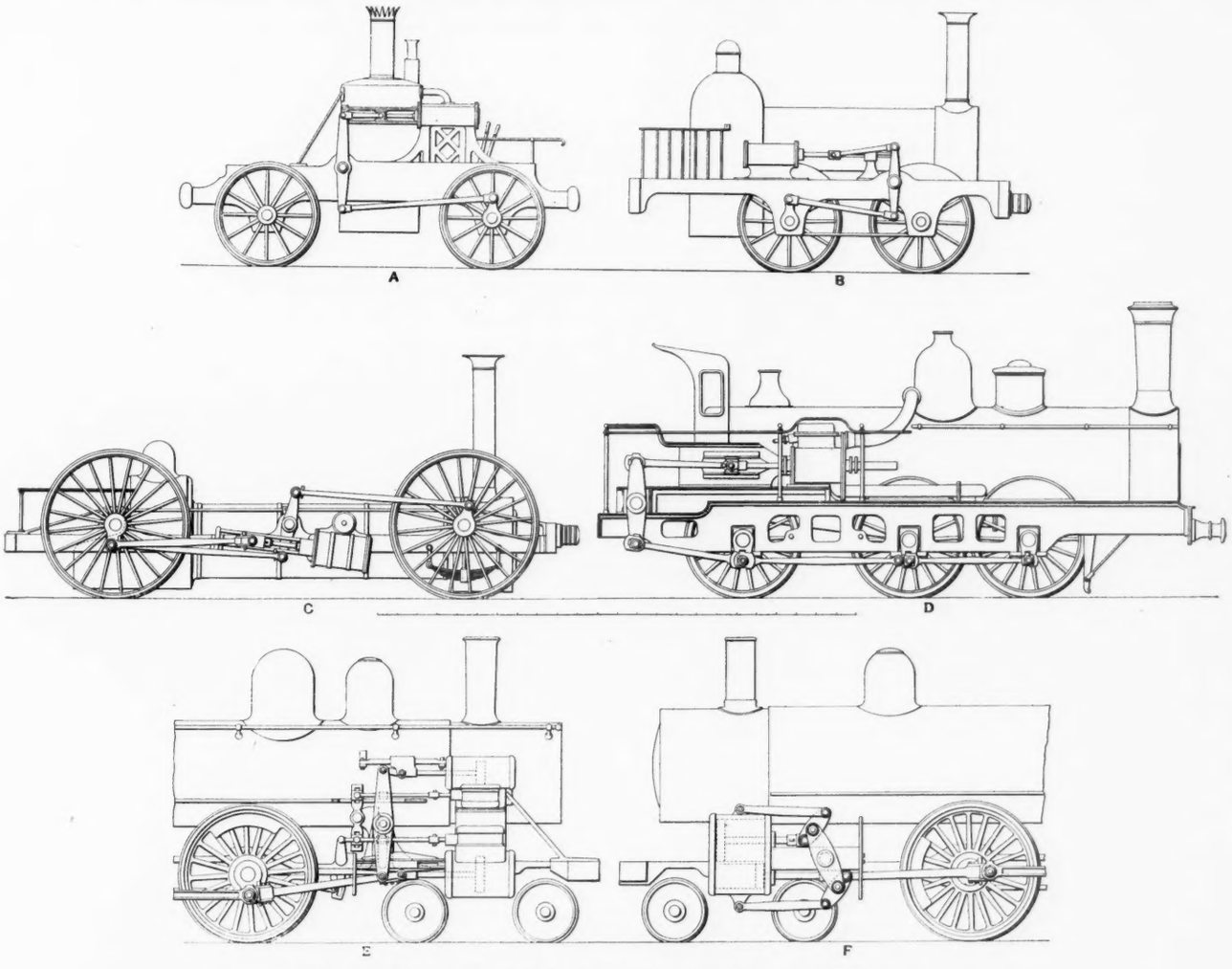

Fig. 1—Diagrams of Side Lever Locomotives. 1833-1903.

As long as the weights of the early locomotives were but little in excess of those designed by Stephenson and others, revolving counterbalances were found practically to dispose of the difficulties under notice, but along in the forties the old evil was found to be not dead but sleeping, and the question of how to equilibrate the reciprocating masses, as well as the revolving parts, once more engaged the leading engineering minds of the day. They gradually discovered that the objectionable motions of a traveling engine were produced mainly by the momentum of the pistons and their connected parts, but their ideas were still hazy on the subject, Robert Stephenson himself, as late as the year 1845, acknowledging that he could not make up his mind about it, adding, "I do not believe that it is the steam that causes the irregular action, but I believe it to be the mere weight of the pistons themselves, and therefore if we could contrive to balance the pistons by the weight upon the wheel, we should get rid of that very much."*

It would thus appear that Stephenson was not aware of the fact that Thomas Russel Crampton, the well-known inventor, had, in the year 1843, published a letter in the *Railway Times* in which he maintained that the chief cause of unsteady running was the unbalanced reciprocating masses, and that in the first engine he constructed all of the reciprocating parts were weighed and two-thirds of their weight was applied to the driving wheel balance. Although the results were satisfactory, it appears that Crampton did not repeat this expedient in his subsequent designs, and D. K. Clark, some years later, read a paper before the Institution of Civil Engineers in which he affirmed that the one primary and sufficient condition was that the revolving and reciprocating masses of the cranks, connecting rods, cross-heads, piston rods and pistons should be balanced in the wheels, and as a proof of the correctness of his theory he stated that he had taken an express engine on the London & South-Western which had balance weights of 85 lbs. within the rims of the driving wheels, and applied others weighing 186 lbs., balancing the whole mass

*See Stephenson's evidence before the Gage Commission, Question 247.

acting at the crank pin, and the locomotive ran so much more steadily with the new balance weights as to take the engine driver by surprise. By elaborate experiments it was demonstrated to Clark's satisfaction that "correct equilibration," to insure steady running, economized 10 per cent. of the fuel consumed by an unbalanced engine. This plan was nothing more than applying an excess counterbalance, which was a palliative as long as weights and speeds were moderate, but as both rapidly increased in the early sixties the destructive effects of hammer-blow on the rails soon defined a limitation to this comparatively easy way of overcoming the evil.

It should here be noted that the earliest British freight locomotives were generally four wheels coupled inside cylinder engines, with, of course, coupling rods on the outside, and it was discovered in these that if the outside and inside cranks were placed 180 deg. apart (they were not always so) the engines ran with less nosing than the inside-connected single-driver engines. The obvious reason for this was that the momenta of the parts connected to the oppositely-disposed cranks partially neutralized each other; but it cannot be said that this design was the origin of the four-crank engine, which is the balanced engine of to-day. It is, however, certain that by observing the effects of reciprocating parts moving in contrary directions, the early engineers formed some conclusions as to their favorable action on the engine as a traveling carriage, for with a short wheel base, nosing was one of the worst troubles they had to contend with. It is interesting to observe, by the way, that early locomotive nomenclature was drawn partly from sailor's expressions, for nosing was called "yawing," and when an engine was sent to the repair shop she was said to be "taken into dock"—both nautical terms.

The foregoing remarks have been thrown together by way of introduction, and thus far we have only considered engines with simple balance weights in the driving wheels. There were, however, some early designs which were found to overcome the defects of unbalanced locomotives, but they involved more or less complication, which hindered their general adoption at the time, and they quickly fell into disuse. Their designers also soon joined the ranks of the forgotten—that vast and ever-increasing army, but, as fashions go in cycles, we now find similar systems proposed, and one plan, that of four cranks, has evidently come to stay, and will give the steam locomotive a new lease of life pending its final supersession by the electric motor.

Old-time locomotives having specially designed parts to overcome the objections which the modern four-cylinder engine has successfully met may be generally classified under three divisions, namely:

(1) Engines having an intermediate driving shaft, either rocking or revolving, by which the cross-head connecting rod moved in the opposite direction to the crank connecting rod.

(2) Engines with a plurality of cylinders and cranks.

(3) Engines in which two cylinders were provided with double pistons and their accessories working in opposite directions, with mechanism to keep the pistons always in their proper relative positions.

All of these locomotives had elements which tended, more or less, to subdue erratic motions of the engine when traveling at speed, and they were, in the by-gone days, variously styled "Equilibrated," "Compensating," and "Compensated" locomotives.

Diagrams and incomplete drawings of these engines have been in the writer's possession for many years, but he has delayed publishing them, hoping that by repeated inquiries and investigation, working drawings of these interesting examples would be secured; but his efforts have been only partially successful. However, it has been decided to publish the present article, as the engines will not only be of interest to some readers, but the subject is, in a measure, timely, in view of the growing popularity of the balanced engine, and, as "history repeats itself," the reasonable certainty of some of the features of these old locomotives being revived in future designs, and their designers will naturally be under the impression that their ideas are novel and original.

We will now take up our engines in detail, the source and character of each illustration drawing being given—not merely for the reader's information, but in the hope that should these notes come under the eye of someone possessing better drawings or fuller details, he may be induced to publish them, and so make the fragmentary history of early balanced locomotives reasonably complete.

Fig. 1 is a sheet of diagrams drawn to a uniform scale, showing some designs of engines falling under the classification of Division 1.

Diagram A illustrates the earliest engine of its class that the writer is aware of. It was built in 1833—nearly coeval with Stephenson's "Rocket," and is one of the rare examples of a British locomotive with a vertical boiler. This engine ran on a short road that was built between Bolton and Kenyon Junction, where it joined the Liverpool & Manchester Railway, and is now a part of the London & North-Western system. Unfortunately, all descriptive details of the engine are wanting, but the equilibration of the reciprocating masses can be easily understood, for the oppositely moving parts partially balanced each other, although with the vertical boiler and high-pitched cylinders the engine was probably an unsteady rider if it ever went fast, which is doubtful. It will be seen that the fulcrum of the side lever or vibrating arm was not in the center of its length, probably to get "extra leverage"—so much sought after by mechanicians from the earliest times to the present. This diagram is a copy of one accompanying a paper read before the Cleveland Institution of Engineers (England) by the late Theodore West, in 1886. West was one of the few engineers who was sufficiently interested in the historical development of the locomotive to preserve some records of it. He obtained the diagram from the late E. A. Cowper, M.I.C.E. As both gentlemen are deceased, no further particulars can be obtained.

But it is doubtful if the earlier locomotives of this class were originally designed to overcome the disturbing effects of reciprocating parts or cross-head thrust; it is more likely that their steady action was discovered incidentally, and the arrangement was suggested by the old side-lever marine engine, which some of us may be aged enough to remember. Early locomotive design was founded on stationary engine practice, and the desirability of having a driving shaft running in fixed bearings so that the vertical play of the driving wheel boxes would have practically no effect on the pistons and slide valves appealed very strongly to the old school of engineers, who were loath to depart from the accurate movement of Watts' beam engine, or that of its close relative, the side-lever marine engine.

Diagram B shows the outline of an engine built by Braithwaite & Milner, whose works were in the New Road (now the Euston Road), London. This firm built many engines for early American railroads—some for the Philadelphia & Reading. The engine illustrated was running on the London & Greenwich Railway* in 1836. The working parts were arranged as in the previous example. No information as to the engine's performance can be obtained at present, and we shall have to pass it over, merely remarking that the drawing was published in Theodore West's paper, previously alluded to, the original also being contributed by E. A. Cowper.

(To be continued.)

The production of petroleum has so increased in Galicia (Austrian Poland) that the price has fallen, and representatives of the oil producers petition the government to reduce the tax on oil, to appropriate means for storage tanks and to buy 30,000 carloads for fuel on the State Railroads.

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*See the *Railroad Gazette*, December 18th, 1896, page 881.

NORTH-WESTERN PASSENGER STATION AT CHICAGO.

The Chicago & North-Western Railway has made public the general plans for the new passenger station and terminals it is preparing to build in Chicago. The architectural plans are completed. There are presented herewith reproductions of two drawings by the architects of the exterior of the proposed station and train shed.

The drawings indicate that the new terminal will take rank among the finest buildings, architecturally, in Chicago. Messrs. Frost and Granger, the architects, who were also the architects of the La Salle street station at Chicago, have had charge of the design and have visited and studied the principal railroad terminals at London, Liverpool, Paris, Vienna and Edinburgh in search of suggestions that would help to make the new station not only beautiful, but also of the greatest practical use as a portal or entrance in which patrons of the North-Western may most expeditiously and comfortably transact the business of entering and leaving Chicago.

The essential feature of the design is a great colonaded entrance of lofty proportions that towers 140 ft. above Madison street, on which the station will face. There will also be an entrance on Canal street, the station being at the corner of Madison and Canal. Before the entrance is to be a broad pavement or esplanade from which will rise granite columns that will guard the inner vestibule. The esplanade will be lighted by large bronze lamp standards having clusters of electric lights and four big clock dials, each 12 ft. in diameter, will look down from the granite wall.

Madison Street Entrance; Chicago & North-Western Terminal.

The new terminal will be, with the exception of the South station at Boston, the largest railroad terminal in the United States, and will involve an expenditure officially estimated at $20,000,000. Many plans had been investigated and discarded before the one finally chosen was selected. More than 300 trains a day now use the North-Western's Wells street station Chicago for arrival and departure, the total number of people now handled there daily being almost 50,000. The train capacity of the new terminal will be more than five times that of the present station; in other words, it will have facilities, it is estimated, for handling a quarter of a million people daily.

TREATMENT OF THE TRAIN SHED.

One of the most important features, from an architect's point of view, is the treatment of the train shed. This structure will be 840 ft. long, extending over three city squares, but it will not have the usual long black expanse of sooty roof that offends the eye. On the contrary, the facade running north and south along Canal street and Clinton street will be a finished and artistic curtain wall of brick and granite, 48 ft. high, and including in its length the fine portal of the Washington street subway. The train shed roof will not be visible. The 16 long tracks which will occupy the shed will be covered by what is known as the "Bush roof," in which the graceful curve of the roof over each pair of tracks is broken by a concrete slot or duct, running the length of each track and so placed that the locomotive funnels will discharge through it into the open air. The roofs will be of concrete, covered with water proofing material. Skylights will be of wire glass and sufficient in extent to light every part of the train shed.

The train shed concourse has also received in the architect's plans a treatment that is far superior to that usually seen. Instead of being an open space, fenced off from the train shed proper by wire or open ironwork, it is a great waiting room, completely enclosed in glass and metal, with a glass and metal roof, making an airy, bright, clean room, 318 ft. by 60 ft. At either end of the concourse great stairways will communicate directly with the street, and cab stands will be reached without going through the station. There is also to be a stairway to the street floor of the station proper. These broad stairways between the street level and the train shed level of the terminal are of such extent that placed side by side they would form a stair over 100 ft. broad. There will be six public entrances to the station, besides the main entrance on Madison street.

Many months have been spent in negotiations for the necessary real estate for the big station and its approaches. These purchases and transfers have been made in a spirit of liberal settlement with property owners. The site is now being rapidly cleared, and the workmen will soon begin to sink the great caissons on which the building is to rest, reaching 106 ft. down to bed rock.

The management of the North-Western expects to have the new terminal ready for occupancy by January, 1910.

TERMINAL TO BE ELEVATED.

The plans call for an elevated terminal, reached by two elevated approaches of four tracks each, and a train shed 840 ft. long and 320 ft. wide, that will contain 16 tracks, each with a capacity of 15 cars.

The approaches alone to this structure will embrace some 30 acres of ground, 15 acres for the north and an equal amount for the west approach. This is entirely separate, and in addition to the present main lines.

Between Kinzie street and Madison street and Clinton and Canal streets, some 13 acres will be occupied by the tracks and

station. Some idea of the magnitude of the station will be conveyed by the statement that the area of the basement will be over two acres; the street floor of the station building will be 1¾ acres; the train shed will cover six acres. There will be practically 10 acres of floor space devoted to public use.

The new terminal will occupy practically four entire city blocks, bounded by Madison street on the south, Kinzie street on the north, Clinton street on the west and Canal street on the east, passing over Washington and Randolph streets by means of brilliantly lighted subways.

THE THREE LEVELS.

For a clear understanding of the architecture of the new terminal it must be borne in mind that there are first, the street level; second, the train shed level, or main floor; and above this, a third floor, containing several features, such as rest rooms and emergency rooms for the care of invalids.

On the street level, the essential feature of the whole floor is the great lobby, or concourse, where all the business of preparing for travel is conducted. The lofty vestibule or portico which forms the Madison street entrance, opens directly into this public concourse, which has an area of 100 ft. by 250 ft. Surrounding it are ticket offices, cab offices, news stands, baggage checking rooms, telegraph offices, telephone booths, an automobile office, taxicab office, and a well-stocked shop or store in which may be purchased practically everything that a traveler is likely to be in need of, from a handbag or package of shoe polish to the usual fruits, candies and materials for luncheons. The management proposes to develop this store into a feature the like of which has never been seen in Chicago, and it will be completely stocked with all travel conveniences. There will be a lunch-room on this floor—quite a large one—occupying a room 50 ft. by 90 ft, where luncheon can be had quickly, conveniently and at reasonable prices.

The ticket offices will immediately adjoin the entrance to this great lobby on the street level floor. They will be commodious and fitted with a number of features that will enable ticket sellers to handle large crowds of people in the shortest possible space of time. There will be plenty of windows, and a carefully chosen corps of experienced attendants.

The Information Bureau will be upstairs upon the train level floor, in the great waiting room.

A splendid suburban concourse is provided in the center of the station on the street level floor, extending through from Canal to Clinton streets, through which suburban passengers inbound and outbound can conveniently reach the northern part of town via Randolph or Washington street. Those whose destination is further south can use the Madison street entrance.

The cab stands and automobile stands will adjoin the suburban concourse, which will be also provided with ticket offices and other conveniences.

These cab stands and automobile stands are under cover. In fact, everybody can arrive and leave the terminal under cover, either by cab, automobile or street car.

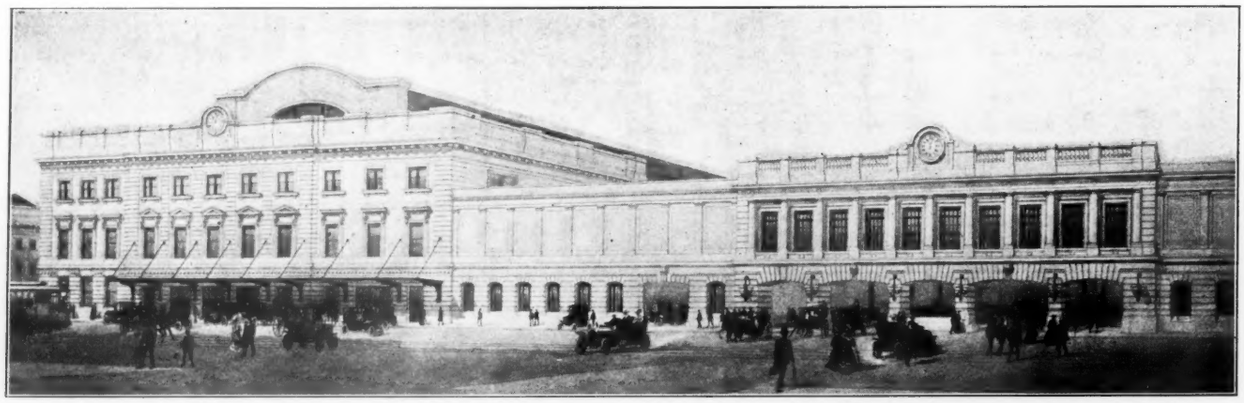
Another part of the great space that is to be utilized is devoted to the care of immigrants. There will be here bath rooms, toilet rooms, and a dining room where for a small sum the immigrant can get excellent service, lunchroom, kitchen, laundry tubs, and every conceivable means of adding to comfort and cleanliness.

President Marvin Hughitt has insisted that all subways and all apartments in the lower story of the station shall be bright, clean and cheerful; and the architect has given all of these lower parts of the building a treatment of cream-colored enameled tile and a brilliant lighting equipment.

The structure croses Washington street over a subway, which of itself is a work of architectural perfection. The white enameled tile with which the subway is lined, and the brilliant arrangements made for its electric lighting, make it one of the most attractive features of the structure. This subway at Washington street has been provided with great portals of granite, the arches of which are treated in the monumental style of architecture.

The street will be widened at this point to 120 feet instead of the street width of 80 feet. This provides for the future widening of the street, and the arched walls of the subway will form a fine pasageway.

On the second floor, which is the train shed level, is a splendid marble lined waiting room, 100 ft. long, 200 ft. wide and 80 ft. high with a vast barrel-vaulted ceiling. The walls are treated with a series of columns or colonnades corresponding somewhat with the main entrance.



Canal Street Entrance; New Chicago Terminal of the Chicago & North-Western.

The lighting arrangements of this room will be of a most brilliant character.

On this floor there will be, in addition to the great waiting room, one of the finest dining rooms in the country, a splendid room, around the walls of which will be a series of panels that can be utilized for magnificent mural decorations portraying the history of the west and northwest with which the development of the North-Western line has been so intimately connected for the past sixty years. It is proposed to make the service in this dining room equal to that of the best Metropolitan hotels and clubs.

On this main floor is also a ladies' waiting room, a beautiful apartment, reached by separate elevator service. Connected with it are retiring rooms, baths and toilet arrangements all of which will be in charge of a corps of maids and attendants.

RETIRING ROOMS AND HOSPITAL ARRANGEMENTS.

Perhaps some of the most novel features of the entire plan for the new terminal, and of most interest to the traveling public, are those which are found on the third floor of the building. Here away from the noises of the street and the crowds, the architects have planned a series of rooms where invalids or ladies with children or infants, or others seeking

privacy, may go directly by private elevator to rooms where they may rest while waiting for connecting trains, surrounded with conveniences for which one must usually go to a hotel or to one's own home. Here are baths, tea rooms, retiring rooms, and emergency rooms where hospital service is rendered and nurses are in attendance. A competent matron is in charge.

On the other side of the building on this same floor are baths, barber shops and a lounging room for men.

This suite is also reached by separate elevator service, and here are private rooms where the suburban dweller or the traveler from a distance may remove the stains of travel, change to evening clothes and proceed to his various social appointments. It is anticipated that this will be greatly appreciated by the large suburban clientele of the road.

SANITATION, LIGHT, HEAT AND VENTILATION.

The terminal will be provided with its own lighting, heating and ventilating plant, in which modern and complete machinery will be installed. Toilet facilities have received, like the various other conveniences, a great deal of serious thought, and not only are the usual public toilet rooms being provided for on a most expensive scale, but special rooms are also planned, where uniformed servants are always in attendance and where a small fee is required. In fact, the toilet facilities of all the terminals in the United States have been looked over in detail, and their capacity multiplied upon. There will be men's attendants, women's maids, men's baths, women's baths, and every imaginable feature that will add to comfort.

The entire structure is fireproof. All floors will be of marble or of marble tile, the interior finish of waiting rooms and lobbies will be of marble and the exterior of the building will be of a light gray granite.

RAILROAD ELECTRIFICATION PLANS ON THE CONTINENT.*

Sweden is likely to assume a distinct lead as regards electric traction on railroads on a comprehensive scale, for the state railroads of that country have taken up the subject. Both in Norway and Denmark, also, electric railroads are under consideration, and in the latter country several electric lines are likely to be taken in hand in the immediate future. Of much greater interest, however, is the preparatory work proceeding in Austria and Germany, where the respective states appear to be anxious to see the question advanced through rational and exhaustive investigations.

A distinguished member of the Imperial and Royal Austro-Hungarian Railway Board, Ober-Baurat Baron von Ferstel, recently delivered an interesting lecture on the subject, as far as it concerned Austria, at the Austrian Society of Engineers. This lecture has attracted much attention on the continent. He first dealt with the clsas of railroads which particularly called for electrification, and the different advantages and savings arising from it. The increasing cost of coal, he said, was an important reason for adopting electric traction; the price had risen 64 per cent. within two years, and for the present year Austrian railroads would require 730,000 tons of imported coal from German-Silesia, the Saar and the Ruhr district, and from England, the inland coal mines supplying some 640,500 tons. Matters in Austria resemble in this respect the conditions in Italy, Switzerland and Sweden, where the dearth of inland coal has an important bearing on the case for the introduction of hydro-electric power on the railroads.

The consideration is emphasized, as far as Austrian Alpine railroads are concerned, by the fact that the cost of transport is exceedingly high, in some cases almost equal to the cost of the coal; hydro-electric traction would seem, therefore, for more than one reason, a natural and desirable substitute for steam. Moreover, in Austria, as elsewhere, a fear has arisen that several comparatively young industries may seize upon so much water-power that the state will be left in the lurch; hence, the extensive purchasing of waterfalls by the Swedish state, and legislation, already effected or still under consideration, in various countries, to secure, if not a monopoly for the state, in any case a power to control and regulate the disposal of the waterfalls. This, at least, is the case in Norway, Italy and Bavaria.

The investigations carried on in Austria cover all the lines worked by the state railroads, irrespective of their being owned by the state or by private concerns. The aggregate mileage of the railroads in question amounts to 2,500 miles. In Austria the electro-technical studies of the question, and those referring to the traffic, are so far being carried on apart from the investigation of the water-power question. In order, however, to be fully prepared with all particulars of power requirements for the different districts, and from the different waterfalls, the whole of the system of railroads has been divided into 150 sections. The clubbing together of the different sections likely to come within the area of any one water-power central station will be comparatively easy, and will allow of various alternatives. It is claimed that never has the electrification of a comprehensive railroad system been more carefully prepared than in this case. The comparative details for steam and electric traction have been made out in as exhaustive a manner as possible. Experts in various industrial branches are also being consulted as regards the system to be chosen.

The survey of the waterfalls likely to come within the limits of this great scheme—numbering about 40—is being proceeded with, and will be pushed ahead energetically during the present summer. So far plans appear to have been completed with regard to some 12 power plants, referring to a length of valley of some 55 miles, between Boden Lake and the Kufstein streams; these 12 falls have an aggregate height of fall of 5,500 ft., averaging 460 ft. for each station, with an aggregate minimum constant power of 41,100 h.p.

Within the German Empire experimental electrification of railroads has, of course, been carried on for several years; but the more comprehensive schemes of electrification at times put forward, as, for instance, a Berlin-Hamburg electric railroad, have so far been allowed to remain in abeyance. Of late different plans of electrification have assumed more definite shapes, and, as in Austria, the whole question is now being officially investigated and reported upon, and, as far as can be foreseen at present, it is possible that the next few years may witness important developments in this direction.

Among the German states it seems probable that Bavaria will take the lead on account of the natural conditions of the country, which is rich in water-power, but poor in coal. The Ministry for Public Traffic has recently prepared an exhaustive and instructive report on the question of electrification of the Bavarian state railroads, advocating a classification of the state railroads into two groups, of which one comprises such lines or systems of lines which, on account of the nature and extent of their traffic and their proximity to cheap water-power, are well suited to electric traction. The state railway board is prepared to point out the requisite waterfalls as soon as the Department of the Ministry for the Interior, which deals with the water-power of the country, is ready to take action in this connection. With regard to the second group of lines, the adoption of electric traction may not be found expedient for some time to come, and the water-power, upon which this second group of railways will have to rely, is in the meantime to be placed at the disposal of industrial concerns, but only on such conditions, as regards the nature and duration of the concessions and the state's option of purchase, that the state railroads, when it may be found necessary, from time to time, will be able to acquire such falls or power stations. The state railroads are expected to act in a spirit tending to ad-

*From a paper in *Engineering*, London.

vance the industry of the country. Military considerations also appear to have to be consulted with regard to such Bavarian railroads as may, or may not, be chosen for electrification; this side of the question will, on the whole, be allowed to stand over for the present, but it may be said that the military authorities have raised no objections to some lines, of minor importance from a military point of view, being promptly electrified in order to obtain experience which should be of great value in the further development of the question.

The first question to be settled was the ratio of the maximum power required to the average power. The mean figure arrived at is 3. But the actual ratios vary very much on different railroads, on some of which electric power has already been adopted. Thus, on the Salzburg-Berchtesgaden line, the average demand is 550 h.p., but the maximum is 2,950—5.37 times larger than the average. On the Munich-Augsburg line the ratio is 2.58; on the Munich-Partenkirchen line we have 21,500 h.p. maximum, against an average of 5,700 h.p.—a ratio of 3.78. The calculations for the total power required by all the railroads of the kingdom have been based on the assumption—derived from actual data, of course—that the requirements per ton-kilometre are 41.75 watt-hours by passenger trains, 27.2 by goods trains and 33.4 watt-hours on local lines. That the goods trains consume less power is ascribed to the fact that they travel more slowly, and that the conditions are more favorable than is the case with passenger trains. Power is to be supplied from a great number of feeder stations. In allowing for the power capacity of these stations, 10 per cent. has been added to the actual figures to meet losses arising from unforeseen stoppages and delays; 15 per cent. more for the conversion of mechanical into electrical energy; 25 per cent. more for line loss in voltage, assuming main conductors at 50,000 volts and working conductors at 10,000 volts. Making these allowances, it is thought that 142,000 h.p. would suffice on an average, and that three times that figure, 426,000 h.p., might be required as a maximum, to deal with the whole railroad traffic. Since, however, the conversion will probably occupy a good many years, and will not be completed before 1920, a further 42 per cent. have been added to these figures to meet the presumable growth of traffic during this period. Thus, about 600,000 h.p. would have to be provided. It is estimated that the running waters of Bavaria offer at present still 300,000 h.p. available. When use is made of the Alpine lakes, however, and notably of the Walchensee, it will be possible to meet the maximum demand by hydro-electric installations without any difficulty. It is pointed out that the lakes could be utilized as feeders for rivers, which would not, in that case, have to be furnished with special reservoirs of their own.

As regards the choice of system, the report sums up in favor of single-phase current. It is not considered that direct current could profitably be supplied to heavy locomotives by a third rail over distances of more than 3.5 kilometres and at a pressure exceeding 1,000 volts; the third rail would, moreover, be too dangerous at the railroad stations and crossings. Three-phase currents are objected to because the motors, unless fitted with complicated mechanism, would always run at the same speed, and because they necessitate three wires and complicated switches. Single-phase current is thought to be the most suitable, though it may not be so economical for long-distance transmission as three-phase currents. The question of the recovery of the electric power on down grades has not escaped attention. Such recovery is possible, though it has not proved simple with the three-phase system, and a slight alteration would also make it possible with the Winter-Eichberg single-phase series short-circuit motors, to which it is not directly applicable. The inquiry has demonstrated, however, that only about 2.3 per cent. of the absorbed energy could be recovered from the trains running down inclines, and this factor would not be decisive, therefore, as to the selection of the current system.

The cost estimates refer to special lines, some of which are already worked by electricity, notably various mountain railroads on which a more elastic and more rapid service can be maintained with electric than with steam-power. In some cases, for instance, on the Munich-Innsbruck line, the electric project has already assumed definite shape, and the estimates also take into consideration the necessity for relaying the telegraph and telephone lines. Other items included are attendance on the locomotives, materials, working expenses and maintenance of locomotives, permanent way, conductors, etc. The estimates and the general conclusions are favorable to the adoption of electric power, and it is, moreover, pointed out that we must be prepared for rising prices for fuel, and that water-power will hence become relatively cheaper. The lines where electric traction could forthwith be adopted comprise the Salzburg-Bad Reichenhall-Berchtesgaden Railway, and the Garnisch-Partenkirchen Railway to the Tyrolese frontier at Scharnitz, and at Griesen, for which purpose an extraordinary grant is being asked. Next in consideration there come the following railroads: Munich-Garnisch-Partenkirchen, Tutzing-Kochel, Weilheim-Peiszenberg, Munich-Tölz, Holzkirchen-Schliersee, Holzkirchen-Rosenheim, and the local line of Munich-Gauting. The most convenient power stations for the above lines will be the Saalach station at Bad Reichenhall (4,000 to 5,000 h.p.), the station at Lechbruck (about 20,000 h.p.), and last, but not least, the Walchensee station, which, when completed, will produce about 50,000 h.p. throughout the 24 hours, and at its earlier stages from 25,000 to 30,000 h.p.

Owing to the relative cost of coal and water-power the southern and southeastern parts of Bavaria are particularly suitable for the use of electric power; the freight charges on coals are very high, while water-power, on the other hand, is cheaper there than further north, owing to the proximity of the Alps. In consequence it may prove economical to adopt electric traction in southern Bavaria, even on lines with a comparatively small traffic.

Among the railroad boards which have gone in seriously for electrification is the one at Essen. The first line to be electrified will be the Osterfeld-Heiszen-Hattingen, its passenger traffic being first dealt with in this way, and an electric railroad through the Eifel, intended for the goods traffic between the Ruhr district and the Saar district and Lorraine, is also planned. The latter, however, on account of its great cost, is likely to stand over until some experience has been gained on the former line. The question of cost naturally has a deterrent effect, as, for instance, in connection with the local railroads in and about Berlin, the electrification of which has often been advocated, but the cost, estimated by some at £20,000,000, has hitherto stood in the way.

The aggregate length of the Leipsic Bitterfeld-Magdeburg and the Leipsic-Halle Railway is just 100 miles, and these railroads will be used for making exhaustive preliminary trials of electric traction, both as regards passenger and goods traffic.

CAUSES AND SOURCES OF CLAIMS.

The stream of loss and damage claims may be likened to a great river. The sources of the stream, the little springs, are the General Managers, the Traffic Managers, the classifications, the rates, the Contracting Agents, the people who ship, who haul the goods, who receive the goods, who load and handle cars, who forward the cars, who receive the cars and the goods.

The Police Magistrate and politics are fruitful springs. Fruitful because it may be said that those gentlemen have an eye to the "plums." There have been cases where they were suspected of a greater solicitude as to the next election than was compatible with even-handed justice. Is it asked how? Petty thieving should be discouraged. Anything like the butt-

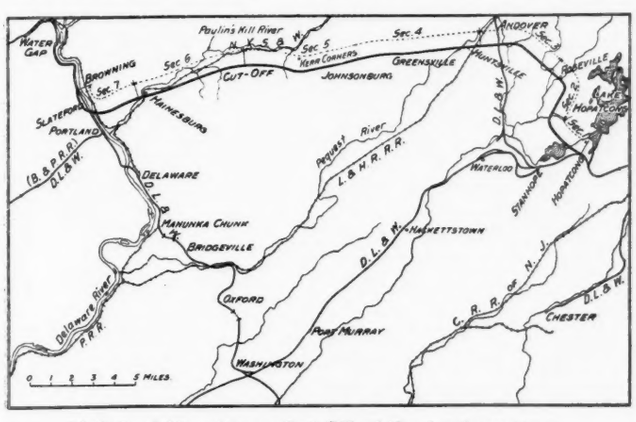
end of the law would tend to discourage them. Recall the case where a man was caught with a wagon half filled with coal, haled to the police court, and charged with its theft. "Where is this coal?" demanded the magistrate. "Why isn't it in court as evidence?" Discharged, and the man caught red-handed is turned loose, to repeat the act at the earliest opportunity and to recite it to those of his ilk, who likewise help themselves. Trainmen caught in an opened car, explain that they found the door open, and had "just got in to see if things were all right." Or a man caught carrying plates of spelter between rows of cars, who says he found them on the ground and was "taking them to the yard office." Discharged. And a vote for the magistrate at the next election.

Even juries can be worked on, and when the case is presented of a hard-hearted and soulless corporation, seeking to incarcerate a poor body who has done nothing but take a little coal to keep from freezing, the verdict sets the victim of the oppressing carrier free, and adds the jury to the list of those who swell the stream of claims, for the petty thief is but encouraged to try again, and the coal man has further occasion to demand pay for what the carrier lost.—*S. D. Webster, St. Louis.*

THE NEW LACKAWANNA CUT-OFF.

BY F. L. WHEATON, ENGINEER OF CONSTRUCTION.

The Delaware, Lackawanna & Western was, at its inception, a coal carrying road, built to carry its coal from the mines to the eastern markets, and when in the early fifties it began to extend its line eastward, it was, like other roads of that day, lacking in financial strength. As the country through



Slateford-Hopatcong Cut-Off of the Lackawanna.

which it must necessarily build was at best exceedingly rugged and mountainous, its management was compelled in a way to extend it along the line of least resistance at some points, rather than by the most direct route toward the coast. The road was therefore built from Scranton southeast over the Pocono mountains and through the Delaware Water Gap, to a point on the Delaware river, near Portland, Pa., by the parent company, and from the Delaware river southeast to Hampton by the Warren County Railroad, and leased to the Delaware, Lackawanna & Western.

The drainage of all northwestern New Jersey flows southwesterly into the Delaware river, and the watersheds are high and rocky in the north, decreasing gradually in height toward the south, until comparatively low and level land is reached. This formation necessitated making two tunnels on the line of the Warren County Railroad, one at Manunka Chunk, 975 ft. long, the other at Oxford, 2,996 ft. long.

At Hampton, the Delaware, Lackawanna & Western Co., lessee of the Warren County Railroad, delivered the greater part of its coal to the Central Railroad of New Jersey for transportation to tide water, and at Washington, N. J., a portion was transferred to the Morris Canal, then in the height of its usefulness and prosperity, for transportation to Boonton, Paterson, Newark and other towns along the line of the canal. The construction of the road to Hampton by way of the Delaware Water Gap and Washington was, therefore, no mistake at that time, as it served the needs of those early days at the least expense for construction. At Washington, the Warren County Railroad crossed the line of the old Morris & Essex Railroad, extending from Hoboken, N. J., to Phillipsburg on the Delaware river. This road was later leased by the Lackawanna, and in this way the latter company obtained a through line from the coal fields of Pennsylvania to tidewater at New York.

There is but one point where a railroad building east from Scranton can pass the barrier imposed by the rugged range of the Kittatinny mountains, and that is at the Delaware Water Gap, where in past ages the Delaware river has cut its way through this range. It is, therefore, impossible to materially shorten the line between Scranton and Water Gap, but east of that point the present line makes a wide detour to the south by way of Washington, and then back toward the north through Hackettstown to Lake Hopatcong. Until recently it has been regarded as impracticable to build a more direct line between the Water Gap and Hopatcong, as the route would necessarily cross the water sheds diagonally and at points where the divides are high and rocky and the valleys deep, but on account of the distance and heavy grades and curvature by the present line between these points the management of the railroad has been led to seek a shorter route and one having lighter grades and fewer curves, over which the heavy traffic of its eastern division can be more economically handled.

Three lines had been surveyed previous to the year 1902, with this end in view, but since they extended from various points east of the Delaware river to points west of Waterloo on the present main line, these lines, while shortening the distance about eight miles, were not satisfactory, as they left a stretch of five miles of pusher grade and bad alinement against eastbound traffic between Waterloo and Lake Hopatcong.

In the year 1905, Lincoln Bush, Chief Engineer of the road, projected several lines, the results of which showed it to be possible, at large expense, to build a line from a point below the Water Gap to Lake Hopatcong, which would fulfill all requirements, viz.: shorten the distance very largely, and at the same time reduce materially the grades and curvature and eliminate the tunnels. On December 1, 1905, a party was placed in the field and a preliminary line run between Slateford, a small village on the west bank of the Delaware river, just below the Water Gap, through the county of Northampton, Pa., Warren, Sussex, and Morris counties, N. J., to a point about one-fourth of a mile west of Landing station at Lake Hopatcong.

This survey showed that a line could be built, having a maximum equated grade of 0.55 per cent., saving over 11 miles, cutting out a very large amount of curvature and eliminating tunnels. A final location was then made substantially on this preliminary line, including contour maps, profiles and estimates of cost.

A tabulated statement is given below, showing a comparison of the physical features of the old and the new line between connecting points.

Table Showing Comparisons of Old and New Line Between Slateford, Pa., and Hopatcong, N. J.

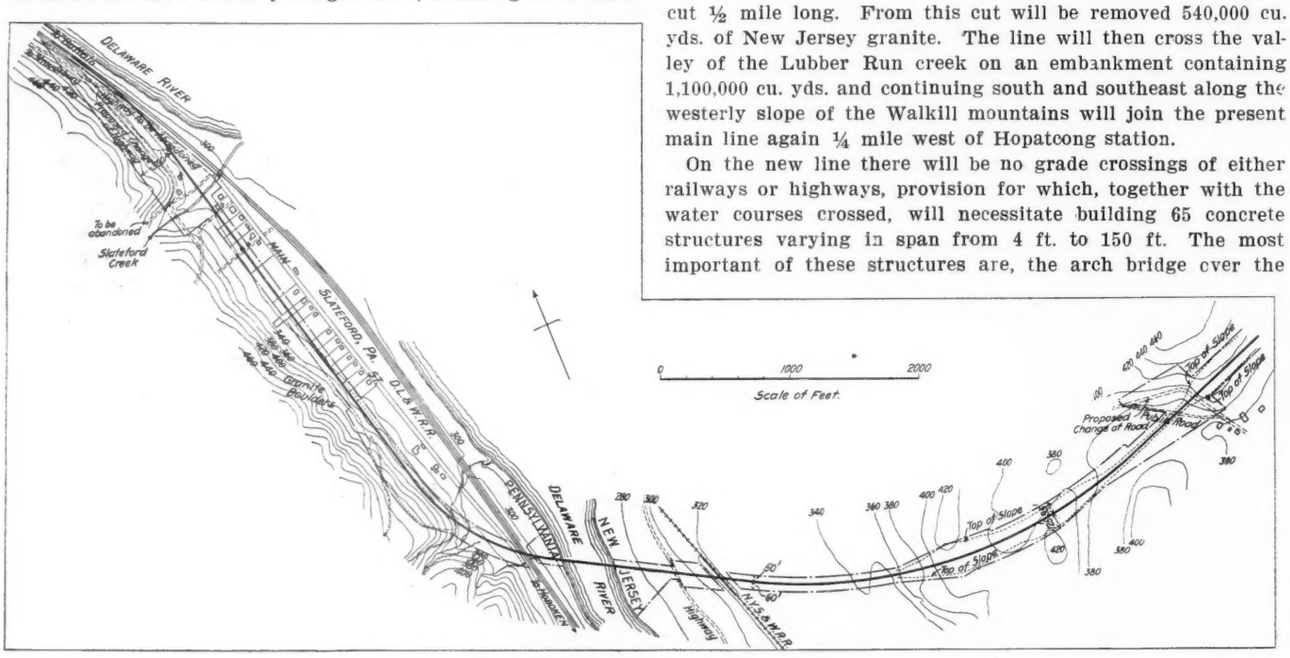
	Old line.	New line.	Saving.
Distance	39.57 miles.	28.45 miles	11.12 miles.
Maximum grade	1.14 per cent.	0.55 per cent.	0.59 per cent.
Curvature-central angle	1,999 deg.	439 deg.	1,560 deg.
No. of curves	57	15	42
Maximum curve	6 deg. 54 min. with a large number of 5 deg. crvs.	One max. curve 3 deg. 30 min.	3 deg. 24 min.
Length of curved line.	12.98 miles.	4.88 miles.	8.1 miles.
Percentage of tangent.	67.2 per cent.	82.8 per cent.	15.6 per cent.
Rise and fall	248 ft.	11 ft.	237 ft.
Length of tunnels	3,971 lin. ft.	.....	3,971 lin. ft.

The new cut off line will reduce the distance between New

York City and Buffalo, 411 miles, to less than 400 miles, which amounts to a reduction of over 2½ per cent.

In order to determine whether the annual saving in the cost of operation and maintenance would justify so large an expenditure as the preliminary estimate indicated, a statement was made, showing what the annual saving would be, based on the actual cost of operation, maintenance of roadway, structures and signals, repairs to rolling stock, engine service, etc., for the year 1905. This cost was then reduced to cost per train mile and the annual saving in each item computed for the saving in distance, grade, curvature, rise and fall, etc., as shown in the foregoing table. The total cost of operation was found to be approximately 57c. per train mile and the annual saving by the construction of the new line showed that an expenditure largely in excess of the estimated cost of its construction would be warranted.

In making up the statement of annual saving many items were necessarily omitted for the reason that they could not be reduced to dollars and cents. Some of these items are as follows: The saving of approximately twenty minutes in running time of every passenger train over the new line and one hour in the time of every freight train, resulting in a corresponding increase in the earning capacity of every engine and car in the service, and a reduction in per diem charges paid for foreign equipment. Another item of saving will be a decrease in the liability of damage to equipment by reason of derailments which, other things being equal, is in direct proportion to length of line, but in this case should show a much greater proportional decrease owing to the reduction in gradient, curvature and rise and fall.



Map of Western End; Lackawanna Cut-Off.

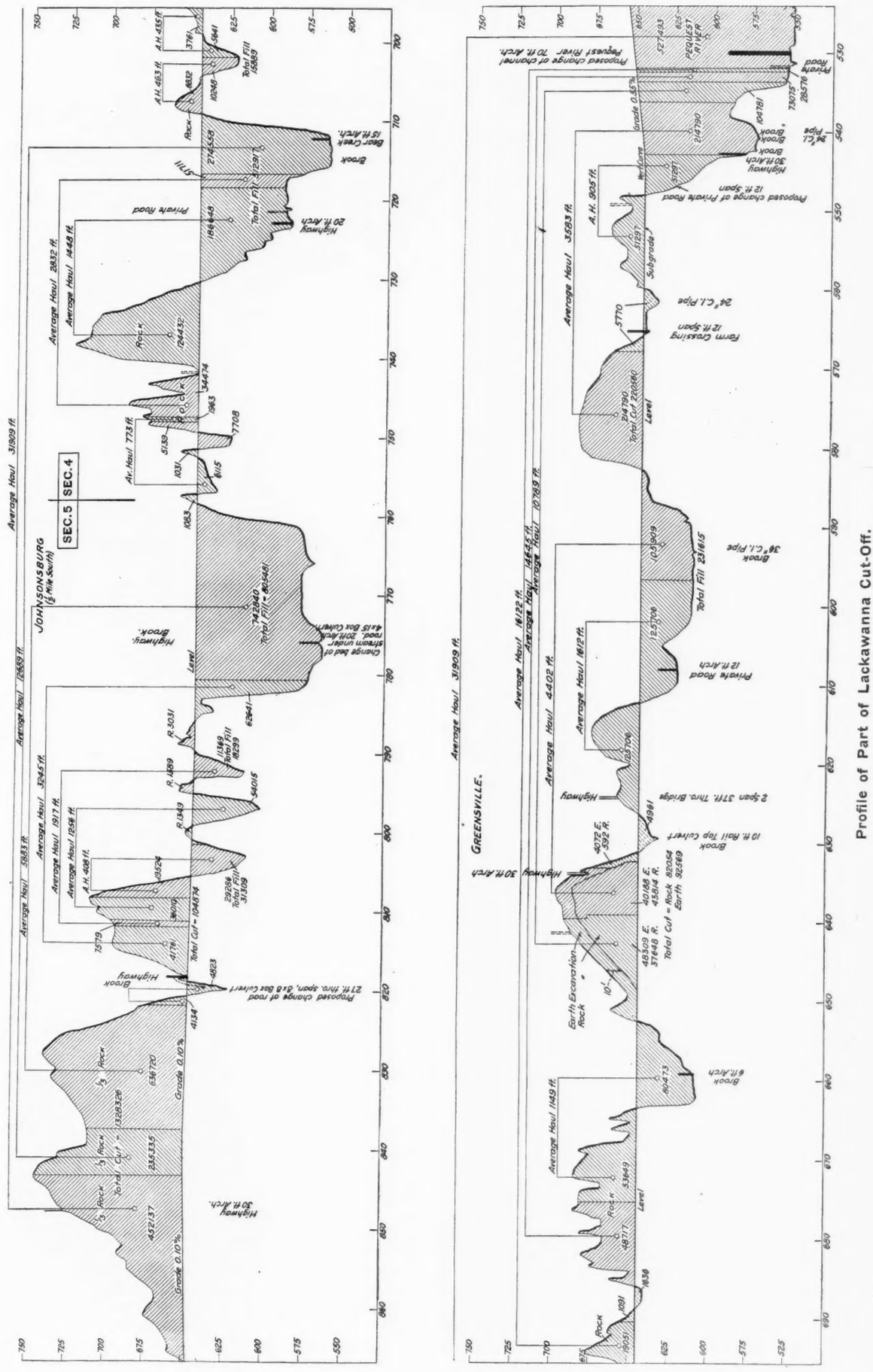
The new line as located leaves the present main line at Slateford, three miles below the Water Gap station, curves to the right on a two degree curve for a distance of 900 feet and then continues on an ascending eastbound grade of .55 per cent. along the side of the bluff on the west side of the river to a point about three-quarters of a mile south of the starting point, where it swings to the east on a 3 deg. 30 min. curve, the only curve on the line exceeding two deg. and crosses over the present main line and the Delaware river to the Jersey shore. The new line then runs almost directly east along the south slope of the beautiful Paulins Kill Valley to a point near Johnsonburg, where it crosses the divide between the Paulins Kill and Pequest rivers. The distance from Slateford to this point is 12 miles, in which distance a height of 337 ft. above the present main line at Slateford is attained, amounting to an average grade of 28 ft. per mile for the entire distance. Allowing for compensation for curvature this is practically the maximum grade established.

From this point eastward to the Pequest, a distance of six miles, the line will traverse a high rolling table land, broken by high ridges of lime stone thrown up by volcanic action. Over this stretch the grade is practically level, except for a very slight rise and fall of five feet adopted for drainage purposes. From the Pequest river eastward to Hopatcong the gradient is the maximum of 29.04 per mile compensated for curvature. When the line leaves the bluff on the west bank of the Pequest, it will continue on a tangent eastward across the Pequest Valley for three miles on what is perhaps the largest railroad embankment in America. This embankment will be from 75 to 110 ft. high and will contain 6,625,650 cu. yds. of material.

From Kerr Corners near Johnsonburg to the mountain east of Andover, a distance of 10¾ miles, there is only one 6 deg. 30 min. curve. At a point about one-half mile east of Andover the line will curve to the south crossing through the divide between the Pequest and Musconetcong watersheds in a rock cut ½ mile long. From this cut will be removed 540,000 cu. yds. of New Jersey granite. The line will then cross the valley of the Lubber Run creek on an embankment containing 1,100,000 cu. yds. and continuing south and southeast along the westerly slope of the Walkill mountains will join the present main line again ¼ mile west of Hopatcong station.

On the new line there will be no grade crossings of either railways or highways, provision for which, together with the water courses crossed, will necessitate building 65 concrete structures varying in span from 4 ft. to 150 ft. The most important of these structures are, the arch bridge over the Delaware river between Portland, Pa., and Slateford; the one over the Paulins Kill, the New York, Susquehanna and Western Railroad and a highway near Hainesburg, N. J., and the 70 ft. arch over the Pequest river about one mile west of Huntsville. The Delaware river bridge crossing will consist of five 150-ft. concrete arch spans, two 120-ft. arch spans and two 30-ft. arch spans, the latter over the present main line tracks and a highway on the Pennsylvania shore. This structure will be approximately 1,450 ft. long and its height from ordinary high water in the river to the base of rail will be 65 ft. The track system is supported by spandrel arches, resting on the main arch rings.

The Paulins Kill bridge will be approximately 1,100 ft. long and will be about 115 ft. high from water level in the river to base of rail. This structure will consist of five 120-ft. concrete arch spans and two 100-ft. arch spans and the track will be supported by spandrel arches resting upon the main arch rings in the same manner as in the Delaware river bridge. The abutments of both structures are of the "U" type, but those of the Paulins Kill are designed with three longitudinal reinforced concrete walls supporting a reinforced concrete slab carrying the tracks and ballast, allowing the embankment to


JOHNSONSBURG
(½ Mile South)
SEC. 5 SEC. 4
GREENSVILLE.
Average Haul 3183 ft.
Average Haul 3245 ft.
Average Haul 1917 ft.
Average Haul 1256 ft.
Average Haul 1448 ft.
Average Haul 2832 ft.
Average Haul 31809 ft.
Average Haul 3583 ft.
Average Haul 44.02 ft.
Average Haul 1149 ft.
Average Haul 10789 ft.
Average Haul 14645 ft.
Average Haul 16122 ft.
Average Haul 16121 ft.
Ar. Haul 7731 ft.
A.H. 435 ft.
A.H. 463 ft.
A.H. 408 ft.
A.H. 905 ft.
Highway 30 ft. Arch.
Highway 20 ft. Arch.
Private Road 12 ft. Arch
Brook 6 ft. Arch
Brook 10 ft. Rail Top Culvert
Brook 30 ft. Arch
Brook 36" C.I. Pipe
Brook 24" C.I. Pipe
Farm Crossing 12 ft. Span
Highway 2 Span 37 ft. Thro. Bridge
Proposed change of road 27 ft. thro. span, 8 ft. Box Culvert
Proposed change of Private Road 12 ft. Span
Proposed change of channel Pequest River 70 ft. Arch.
Change bed of stream under road. 20 ft. Arch. 4 ft. 5 Box Culvert
Total Cut = 1046174
Total Fill 8239
Total Cut 220980
Total Fill 23615
Total Cut = Rock 820354 Earth 92569
Total Fill 3889
Total Fill 3109
Total Fill 742840
Total Fill 485641
Total Fill 27493
Total Fill 2237
Total Fill 8115
Total Fill 6341
Total Fill 5641
Total Fill 4832
Total Fill 3524
Total Fill 1149
Total Fill 1083
Total Fill 1111
Total Fill 376
Total Cut 2355336
Total Cut 1328328
Total Cut 436720
Total Cut 452737
Grade 0.10%
Grade 0.63%
Level
Subgrade
Rock
Earth Excavation
Earth
Pequest At Axle
Private Road
Highway
Brook
Pequest
Pequest At Axle
Pequest At Axle
Pequest At Axle

take its natural slope between the walls as well as on the outside of them and thus balance the earth pressure and avoid the heavy section necessary had they been designed as retaining walls.

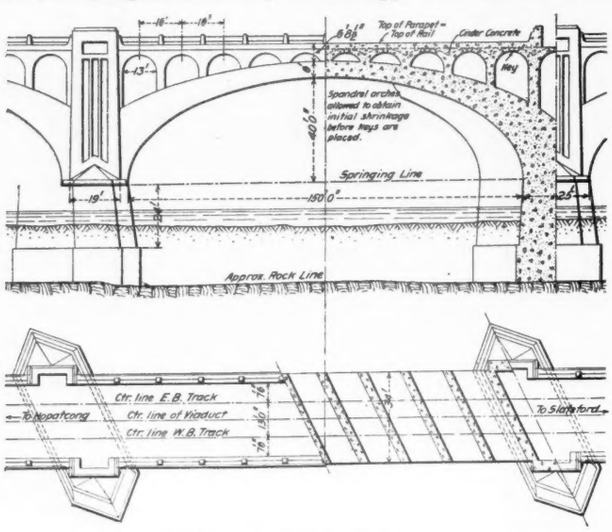
For the Paulins Kill bridge, plans were submitted and proposals asked from contractors on the basis of using the ordinary type of timber centering and also on the basis of using steel arch ribs designed to support a dead load consisting of the arch forms and four complete arch ribs of full depth and two feet in width, the intermediate sections of the concrete ribs to be placed after these had set.

The idea was to build these four steel arch ribs for each span encasing them in the concrete to act as reinforcement and with the concrete rings to be of sufficient strength to carry in addition to the arch forms their own dead load, the dead load of the concrete forming the intermediate sections of the main arch ribs and later to carry their proportion of the live load and the balance of dead load above the main arch ring, thus eliminating the high timber centering. The bids received showed a balance in favor of the steel rib type of centering, but the amount was not sufficient to warrant their use in this case and the ordinary type of timber centering was adopted.

That the proposals did not show a greater difference in cost in favor of the steel centering was due to the fact that there is very little liability of loss of timber centering from freshets at the Paulins Kill crossing and because the ground consisted of hard gravel and sand and was particularly favorable for their support. Another reason was, that while there were five 120-ft. arches in the structure, the specifications required the contractor to furnish only two complete centers and the expense of wooden centering was thus relatively less than where spans are not duplicated.

It is evident that in high structures of this character where there is liability of losing by freshets the ordinary type of timber centering together with a portion of the uncompleted structure and when the foundations for centering are difficult to obtain, the steel centering shown can be used with economy, advantage and greater safety.

The piers for the Delaware river and Paulins Kill structures were so designed that they would support the thrust of the

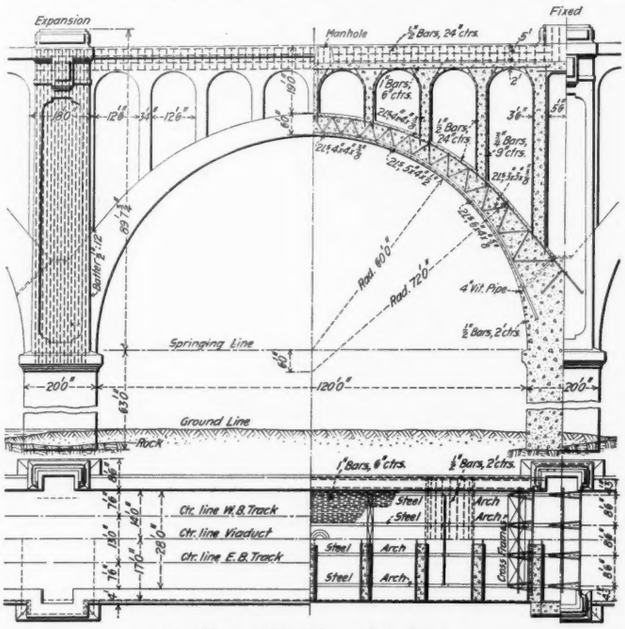


Delaware River Viaduct.

load from the main arch ribs, exclusive of the weight of the spandrel arches and the dead load above them, with the centering removed. This is an important feature of the construction particularly in the design of the Delaware river bridge where there will be a greater liability of loss of false work from high water in the river. On account of the unusual height of some of the embankments the plans provide for carrying streams and public and private roads through the same arch wherever feasible, by either carrying the roadway over the stream or on a reinforced concrete slab or by carrying the stream on one side of the arch opening and the roadway on the other at a higher level. The latter type of construction is illustrated in the plan for the 70-ft. arch span over the Pequest river.

In the specification for grading only two classifications were provided, viz.: earth excavation and rock excavation, with no overhaul.

To aid the contractors in making up their bids, a profile



Paulins Kill River Viaduct.

was furnished them showing the approximate quantities in each cut and fill, the approximate proportions of earth and rock that would be encountered and the disposition of excavated materials showing approximate average distance of hauls from each cut, as seen in the profile illustrated.

In the specifications for concrete three classes of concrete were provided for, of the following proportions:

Class "A," 1 cement, 2 sand, 4 broken stone.
Class "B," 1 cement, 3 sand, 5 broken stone.
Class "C," same as Class "B" with large quarry stone bedded in concrete.

Class "A" concrete is to be used in copings and ornamental railings, class "C" in foundations below ground line and in massive abutments and piers for arches below the springing line, and class "B" in all other cases. The total estimated quantities of earth and rock excavation and concrete are as follows:

	Cu. yds.
Earth excavation	8,861,000
Rock excavation	4,320,300
Embankment	14,621,100
Concrete (all classes)	225,500

The contracts for the work were awarded in seven sections, each contract including all clearing, grading, masonry, etc., on the section.

Following is a list of the successful bidders on the several sections:

Sec. 1. Timothy Burke, Scranton, Pa.
Sec. 2. Waltz & Reece Construction Co., Billings, Mont.
Sec. 3. David W. Flickwir, Terry Building, Roanoke, Va.
Sec. 4. W. H. Gahagan, 189 Montague St., Brooklyn, N. Y.
Sec. 5. Hyde-McFarlin Co., 7 East 42d St., New York City.
Sec. 6. Reiter, Curtis & Hill, Arcade Bldg., Philadelphia, Pa.
Sec. 7. Smith & McCormick Co., Easton, Pa.

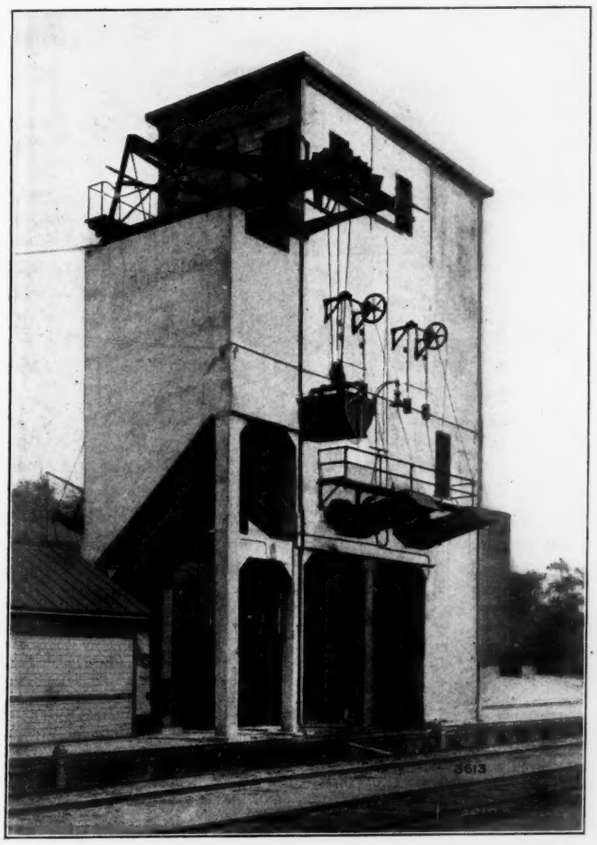
Actual work was begun August 1 and is to be completed on or before August 1, 1911.

All the work has been done under the supervision of Lincoln Bush, Chief Engineer of the Lackawanna Co., assisted by the writer, who located the line and will have charge of construction, and by B. H. Davis, Assistant Engineer in charge of masonry design.

REINFORCED CONCRETE LOCOMOTIVE COALING STATION.

A reinforced concrete locomotive coal and cinder station, of the single-track-supply type, was recently put in operation by the Link-Belt Company, Nicetown, Philadelphia, Pa., for the Pittsburg & Lake Erie at Pollock, Pa. It consists of an overhead coal storage pocket, arranged to hold 200 tons, and a smaller steel-lined pocket, shown on the left of the illustration, with a capacity for 50 tons of cinders.

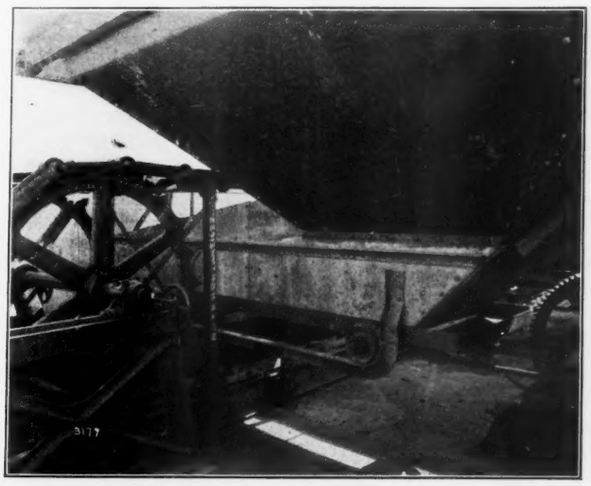
The side of the station shown is that on which the locomotives receive coal, the flow from pocket to tender being controlled by two Link-Belt coaling chutes. This chute is a combination of under-cut gate and swinging counterbalanced apron. The gate is operated by a chain wheel actuating a



Pollock Coaling Station; Pittsburgh & Lake Erie.

pinion and spur segment; it is easily opened and can be closed instantly. The apron, which is hooded to prevent coal from falling over the side of the tender, is so counterbalanced that little effort is required to swing it into and out of coaling position, yet it rests safely in either place.

The coaling track, seen in the foreground, is built over a concrete-lined pit with narrow-gage tracks for trucks on which one-ton gate-bottom cinder tubs rest, as shown in one of the photographs. The tubs may be moved to any part of the pit and a locomotive can thus discharge cinders, flue-dust, etc., while receiving coal from the chutes. The tubs are afterwards pushed into position directly beneath a steel runway built over and extending from the ashes pocket; they are then raised by a single-drum cable-hoist to the runway, trolleyed over the pocket, automatically dumped and returned to the trucks in the pit. The track on the opposite side of station contains a steel hopper, 10 ft. wide and 12 ft. long, for receiving the coal from the cars; this is equipped with a patented, Link-Belt reciprocating feeder, illustrated in the third photograph, which delivers the coal automatically and evenly to a gravity-discharge elevator. This elevator has a vertical travel of 63 ft. to the top of the pocket, and a horizontal discharge-run of 28 ft.; it is made up of V-shaped steel buckets, 36 in. long. 22 in. wide, and 10 in. deep, attached every three feet, between two strands of steel chain fitted with chambered



Track Hopper and Reciprocating Feeder.

rollers. At the regular speed, 75 ft. a minute, its capacity is 75 tons an hour.

The cinder discharge is also over this track; the bottom of the cinder bin, sloped at an angle of 42 degrees, is equipped with a counterbalanced chute and cut-off gate, and cinders may

Track Pit, Cinder Trucks and Tub.

therefore be removed in the cars from which coal has just been emptied into the track hopper.

The entire equipment is electrically operated. A 13-h.-p. motor is used for the coal elevator, reciprocating feeder, etc., and a 15-h.-p. motor for the ashes hoist; both are located in the lantern of the building.

The French company engaged in building a railroad from the French province in southeastern Asia northwest to the Chinese city of Yunnan, is to be dissolved, in consequence of unfavorable decisions of the courts of the French colony.

THE PHILADELPHIA & READING.

The answer of the Philadelphia & Reading in the suit brought by the government under the "Commodity Clause" of the Hepburn bill shows clearly the strength of the position of the "Coal Roads" that are affected by the "commodity clause."

The defense of the Philadelphia & Reading Railway may be based upon two main points, viz.:

That it has no interest either direct or indirect in the anthracite coal that is carried over its line.

That even, although it were interested in such anthracite coal, the so-called "commodity clause" of the Hepburn bill which in effect prohibits a carrier from hauling anthracite coal in which it has an interest is unconstitutional and violative of and repugnant to the Constitution of the United States in four particulars.

The answer of the Philadelphia & Reading Railway Co. gives the present status of the various Reading companies as follows:

(1) The shares of "The Philadelphia & Reading Coal & Iron Company," (which company owns six subsidiary coal companies) are practically all owned by the "Reading Company."

(2) Nearly all the shares of the "Philadelphia & Reading Railway Company" are owned directly by the "Reading Company."

(3) That, therefore, the "Philadelphia & Reading Railway Co." which is the carrier, has no interest direct or indirect in "The Philadelphia & Reading Coal & Iron Co.," which is the company that mines the coal.

The steps leading up to this status are briefly outlined in the answer. Prior to 1906, "The Philadelphia & Reading Railroad Co." was the owner of nearly all the capital stock of "The Philadelphia & Reading Coal & Iron Co.," which mines the coal, and under the Pennsylvania charter of the Coal & Iron Co. the Railroad Co. was authorized to purchase, own and hold the capital stock of the Coal & Iron Co. "The Philadelphia & Reading Coal & Iron Co." was originally the Laurel Run Improvement Co., in the charter of which it was provided that "and it shall be lawful * * * for any railroad or mining company, existing under the laws of this state (Pennsylvania) to subscribe for and purchase the stock * * * of the company hereby incorporated."

During the reorganization of "The Philadelphia & Reading Railroad Co., in 1896, this company became divested of its railroad and leasehold interests, etc., including its interest in the Coal & Iron Co., and a few months later the "Philadelphia & Reading *Railway Co.*" became the owner of the railroad and leased lines of the old *Railroad Co.*, but it did not become the owner of the shares of the Coal & Iron Co.

The "Reading Co." was then created under Pennsylvania laws in 1871 by "An act to incorporate the Excelsior Enterprise Co., with power to purchase, improve, use and dispose of property, to aid contractors and others, and for other purposes." The shares of stock of the Coal and Iron Co., which originally belonged to the Railroad Co., but which did not pass to its successor, the Railway Co., were separately sold to certain persons who afterwards conveyed them to the "*Reading Co.*" Late in 1896 the Railway Co. took possession of its railroad properties and at the same time the Coal and Iron Co. took possession of its coal properties and since then each company has been separately engaged in the operation of its properties. The defendant *Railway Co.* in its answer declares, therefore, that it has no interest in the coal mined by the Coal & Iron Co.

Concerning the second point of defense the "Philadelphia & Reading Railway Co." (while insisting that the interstate transportation of coal by it is not in violation of the so-called "commodity clause" of the Hepburn law for reasons stated above) declares that the commodity clause of the Hepburn act is "violative of and repugnant to the United States in the following particulars" which particulars are here summarized thus:

(1) That the act does not undertake to regulate the transportation of anthracite coal in interstate commerce; but on the contrary undertakes to prohibit absolutely the transportation thereof, and that regulation which term is used in the interstate commerce clause of the Constitution is one thing and prohibition quite another.

(2) That the effect of the clause will constitute a taking the defendant's property without due process of law and compensation.

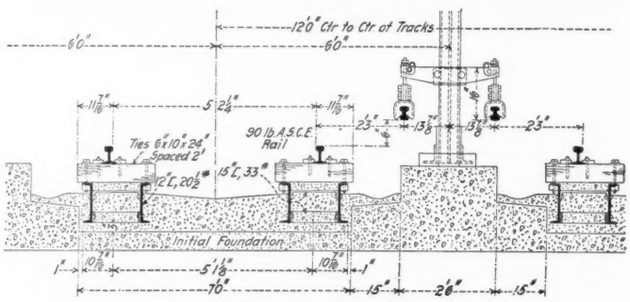
(3) That the "commodity" clause is "class legislation" and unjustly discriminative, in that it expressly permits railroad companies to transport in interstate commerce timber and manufactured products thereof, in which they have an interest, direct or indirect; and yet prohibits transportation in interstate commerce of other commodities, including anthracite coal; and is also unjustly discriminative "class legislation" in that it arbitrarily denies to one class of common carriers * * * the right and privilege of transportation of certain commodities, but imposes no such restriction or prohibition on other common carriers, under said act or its amendments."

(4) "That the penalties imposed by the statutes for violations thereof are of such magnitude in contravention of the eighth amendment of the Constitution of the United States and so unduly excessive and extortionate as to be substantially destructive of the property and franchises of the carriers affected thereby, and in respect to such carriers to constitute a denial of the equal protection of the law."

It was brought out that in the year 1907 out of 12,250,000 tons of anthracite coal produced and sold by the Coal & Iron Co. more than 2,980,000 tons were sold by the Iron Co. in interstate commerce and carried over the lines of the defendant's railway company and its connections; and the coal thus transported by the Reading Railway Co. cannot be thus transported by any other lines of railroads, inasmuch as no other lines are connected with and have access to such lines. The answer is signed by George F. Baer, president.

PHILADELPHIA RAPID TRANSIT SUBWAY.

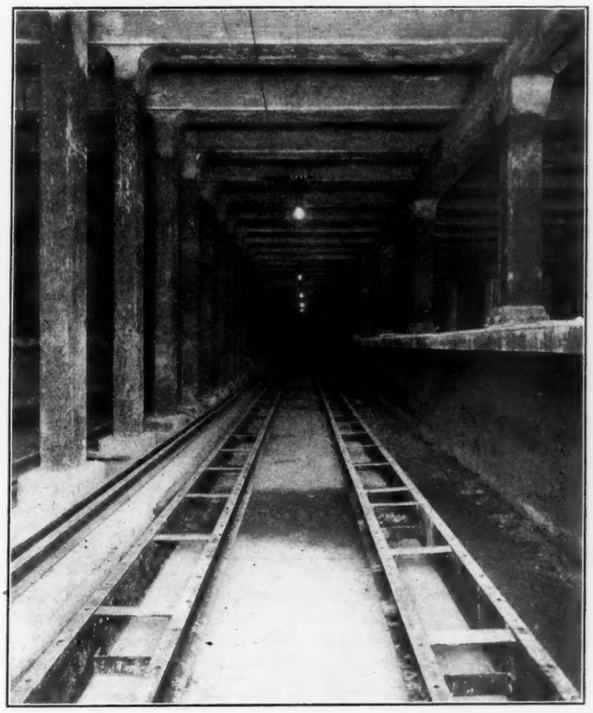
On Monday, August 3, the completed subway of the Philadelphia Rapid Transit was opened to the public. On the previous Thursday a party of guests of the Philadelphia Rapid Transit walked through the subway from Fifteenth street to the Delaware river end. With the completion of this section of the tunnel from Fifteenth street to the Delaware river,



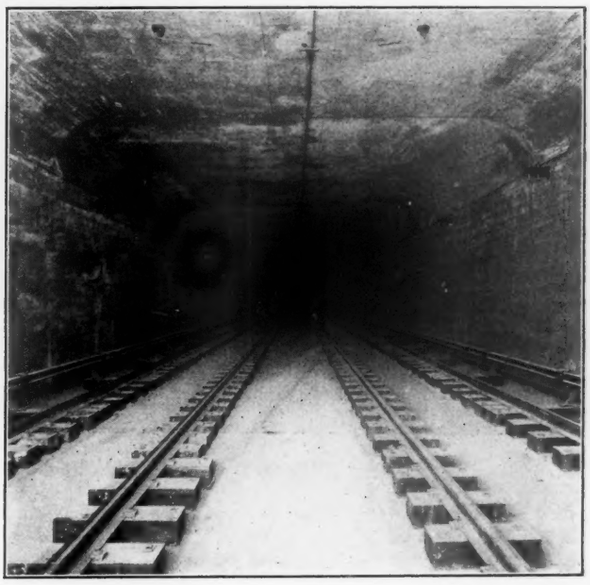
Cross Section of Express Tracks.

trains are run from the Schuylkill river to the Delaware river. From Sixty-ninth street to Twenty-second street trains run on an elevated structure and at Twenty-second street dip down and enter the tunnel which extends to the Delaware river. That part of the line from Sixty-ninth street to Fifteenth street has been in operation for about 14 months, and was described in the *Railroad Gazette*, Aug. 18 and Aug. 25, 1905, and the signals in the subway were described in the *Railroad Gazette*, Nov. 2, 1906, p. 394. The section that is now

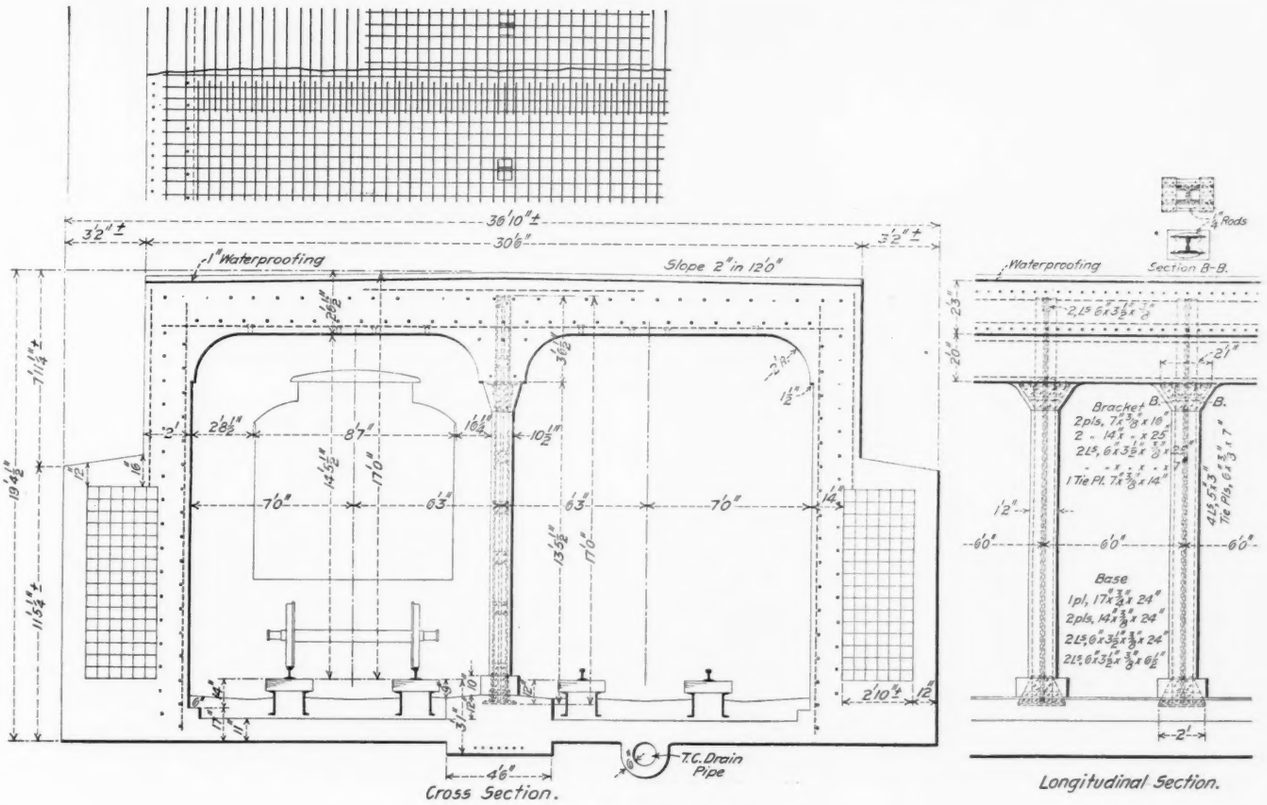
open for operation differs in some instances from the section that has been in operation 14 months. The pillars supporting the roof in the new section are covered with concrete—in fact, the first impression that one gets in walking through the subway is that the entire structure, with the exception of the rails, is of reinforced concrete. The structure of the wall is shown in the accompanying drawing. The tunnel is dimly lighted by electric lights placed at long intervals, and there is no attempt to keep the light out of the motorman's eyes as there is in the New York subway, where the lights on the right-hand side are placed behind, that is, beyond the supporting columns. As in the New York subway stores at some of the stations have entrances through their own doors, and have windows in the subway station. Five-car trains are run on a five-minute headway. The cars have both end and side doors, the doors being opened and closed by compressed air. The way the track is laid on the tie and the tie fastened to the concrete floor is shown in the accompanying drawings and photographs.



Track Substructure Before Concreting.



Completed Track.



Philadelphia Rapid Transit Tunnel.

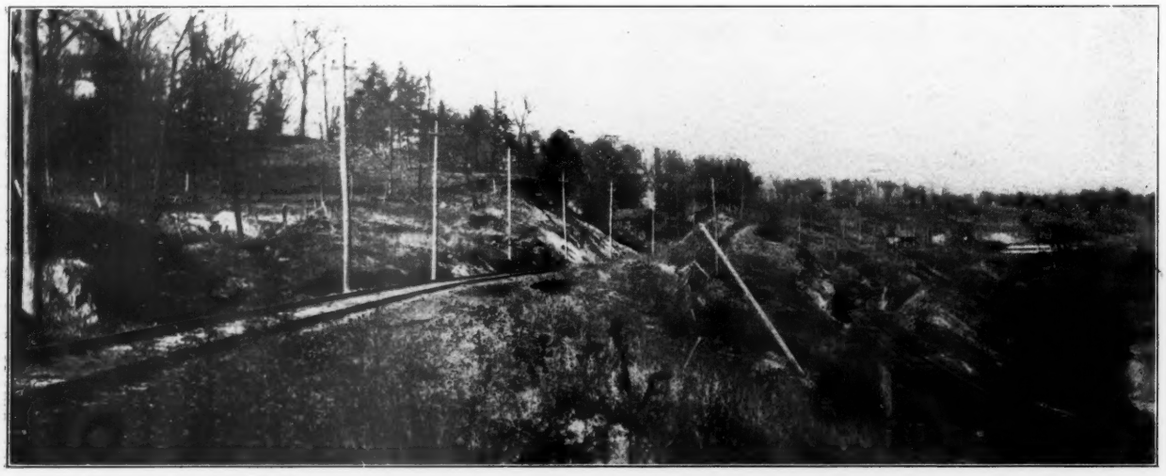
ROADBED MAINTENANCE IN THE SLIDE COUNTRY.

The "Slide Country" is a name given to a section of land on the west bank of the Mississippi a few miles north of Davenport, Iowa, which is gradually sliding toward the river. The section is a mile long and is traversed by the Iowa & Illinois Railway, an interurban line between Davenport and Clinton. The following information on this subject was furnished by P. P. Crafts, General Manager of the Iowa & Illinois Railway:

The sub-soil of the "slide country" is a soapstone clay resting on a shale and ledge bottom inclined toward the river; in some places on a slope approximately 1½ to 1. This sub-soil is of very fine texture; when dry it crumbles very easily and the slightest amount of moisture makes it extremely slippery. Naturally the drainage from the hillside above the railway roadbed must be deflected, otherwise it soaks down through cracks and at some points where the sub-soil consists of other materials, reaches the surface of the shale and ledge, upon which the whole mass immediately begins to move slowly but surely. It does not slip off rapidly, but keeps up a gradual movement until the water passes off.

The action of water on the clay soil itself produces a tendency for the top soil to move off the bottom soil until the slope becomes between 3 and 4 to 1, after which it seems to cease moving so rapidly. In one or two instances where water has worked under the soil on the river side of the track, a crack has appeared at the river ends of the ties, the soil below that point dropping within a few hours, 4 or 5 ft., necessitating very rapid work to maintain a sufficient roadbed on which to run cars.

In one case where it was anticipated that the roadbed would move, an endeavor was made to hold it by piling several carloads of broken stone along the lower side. As soon as the water worked itself well underneath, the roadbed went again, taking the stone with it; in fact, the weight of the stone assisted the rapidity of the movement and it was necessary at one point to hurry in about 25 carloads of earth in order to maintain the track in safety.



Central Section of "Slide Country," Where Movement Is Greatest.

At another point where heavy stones were piled against the river side of the roadbed, the original roadbed, stones and all, has disappeared and is now a part of the public highway, about 50 ft. nearer the river. The movement was quite slow, so that the track was maintained with comparatively slow work. The principal trouble has since been overcome at this place by dig-

As Surface Soil Breaks and Moves Down on the Track, It Is Transferred to the Other Side.

ging a ditch on the hillside and parallel to the track; the ditch at the point of discharge being about 16 ft. deep. The bottom of the ditch was carried down to solid shale and a slot was cut in the shale in which was laid porous tile; the ditch was then filled to the top with cinders. The water coming down from the hillside is thus carried off through the porous tile and the surface water seaps through the cinders down to the tile, keeping the soil underneath the roadbed fairly dry. This ditch is approximately 200 ft. long and slopes to the center where a drainage well and a cross tile carries the water off toward the river. Since this work was completed, the ground affected has moved very little. It is now planned to run longitudinal ditches on the hillside of the track at several points with porous tile at the bottom and filled to the top with cinders, and the company is endeavoring to induce the management of a steam road,* whose track is between its line and the river, to put porous tile in their upper ditches by which cross connections could be made to carry off a large amount of water to the river. It is found that as soon as the upper ditches on the steam line's roadbed are opened there is a movement of the soil to close up the gap, and it is believed that if the ditches were allowed to fill, and drain tile used in the place of open ditches, considerable of the movement would cease, inasmuch as the soil below the steam track down to the river bank has for the past three or four years remained stationary.

Looking Up to Electric Line from Steam Line. The Latter Was Originally Half Way Between.

Two years ago the steam railroad endeavored to stop the movement by driving piles above its roadbed down to the shale. All piles were fitted with steel shoes in order that they could be driven into the shale and hold the bank above. This proved an utter failure, for the weight of the soil above shaved off the piles near the bottom and carried them to a point so close to the cars that it was necessary to saw them off. Some of these piles are now in the middle of the track underneath the ties.

It is thought that as soon as some of the material above the interurban track reaches its natural slope it will not be necessary to remove as much material as heretofore. At a number of points the material can be reduced when it is dry, to practically its natural slope without great expense. But plans for doing certain things to accomp'ish certain objects are very liable to revision, as this "slide country" develops new freaks every few days during the wet season and new problems are constantly presented.—*Brill's Magazine.*

*The Davenport, Rock Island & Northwestern Ry., jointly owned and operated by the Burlington and the Chicago, Milwaukee & St. Paul.

CENTRAL EAST AFRICAN ROADS.

The German Empire has granted a credit of about $16,700,000 for the extension of the Central East African Railroad from its present terminus at Norogoro, west by north, 434 miles, to Tabora, which is 160 miles due south of Muansa, at the south end of Lake Victoria Nyanza, and 264 east of Ujiji, on Lake Tanganyika. The extension to Tabora is to be made within six years, and further extensions to the two lakes are hoped for by the colonial authorities. The Central Railroad begins on the coast of the Indian ocean at Dar-es-Salaam, where a harbor has been constructed. It was planned to build another railroad, beginning at the sea, 150 miles south of Dar-es-Salaam, west by south to Lake Nyassa, but the cost of a harbor has caused this to be given up, and now the colonial authorities purpose to build a branch of the Central Railroad from a point some 200 miles inland west by south to near the north end of Lake Nyassa, about 326 miles, with a branch to Bismarcksburg, near the south end of Tanganyika, 195 miles. These would give an outlet to the coast of both lakes, more than 800 miles long, and the one to Lake Nyassa would reach coal mines. Both would be in position to give the mines in the Katanga district, partly in the Congo State and partly in Rhodesia, a shorter outlet to the sea than any other. What traffic these roads will have depends almost wholly on future developments. There is talk of rubber and there are hopes of cotton, which reminds one that when European countries search for new sources of cotton supply they almost always experiment in the tropics. Cotton will grow almost anywhere in the tropics, but the world's chief supply comes from the temperate zone, and in India it could not be grown at a profit, but for the minute income with which the natives are satisfied. Our war, from 1861 to 1865, raising the price of cotton tenfold, caused cotton to be cultivated wherever it would grow, but since that time only India and Egypt have ventured to compete with America in the European market, and they chiefly for special grades.

General News Section.

The Pullman Co. is screening the windows of its cars on certain Texas runs, as a protection against mosquitoes.

Through traffic on the San Pedro, Los Angeles & Salt Lake was blocked several days last week by heavy rainstorms, which caused washouts near Calientes, Nev.

The Pennsylvania has posted along its Lines East notice to engine crews that the engineer is boss of the cab, and that he will hereafter be held responsible for the work of his fireman.

Station agents on the Delaware & Hudson have organized a council similar to that formed by employees on the New York Central, to protect railroads from drastic and ill-considered legislation.

The Missouri Pacific-Iron Mountain system issued orders on August 6 for the reopening of its motive power shops at St. Louis, Sedalia and De Soto, Mo.; Ft. Scott, Atchison and Osawatomie, Kan., and Baring Cross, Ark.

The construction of cable No. 1 of the Manhattan Bridge over the East river, New York, was begun August 10, when the trolley over one of the temporary footways was placed in operation and began to spin wires between the anchorages.

On August 9 striking miners fired into a passenger train on the Birmingham Mineral Railroad at Blocton, Ala., killing three persons and wounding 11. The train was a special, bearing non-union men to the Blocton mines, under guard of soldiers and deputies.

On August 7 the new Illinois Central bridge over the Calumet river at One Hundred and Thirty-third street, Chicago, was slightly damaged, presumably by a bomb. The bridge is being built by the American Bridge Co., and a number of non-union men are employed on it.

A committee has been appointed by the Commercial Club of Des Moines, Iowa, to investigate and report on whether it is advisable for the club to bring suit to dissolve the merger of a number of small lines that has been effected by the Chicago, Burlington & Quincy in southern Iowa.

The Missouri, Kansas & Texas posted notice in its shops at Smithville, Tex., on August 3, that, effective August 8, the wages of boiler washers would be reduced from $1.90 to $1.60 for a day of ten hours and that the wages of engine wipers and shop helpers would be reduced from $1.60 to $1.40 for a day of ten hours.

The Michigan Central is equipping its east division (Detroit to Jackson), its Toledo division (Detroit to Toledo), and its Bay City division (Detroit to Bay City) with telephone lines, for the purpose of despatching trains; and as soon as these divisions are equipped and the telephone despatching system is in practical operation, it is expected to extend the service to other divisions.

The Railroad Commission of Texas has issued notice that a hearing will be given on September 9 on the application of the Texas Car Service Association for modification of the car service rules in effect in Texas. The railroads will propose a large number of amendments, the adoption of which would simplify existing rules and reduce the amount of free time now allowed on certain kinds of business.

The railroads in Kansas and Nebraska suffered damages aggregating over $1,000,000 as a result of the floods in those states in June. The repairing of the damage cost the Union Pacific, which was the heaviest loser, about $250,000. The Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific were also heavy losers and nearly all of the railroads operating in these states suffered more or less.

The appeals of the Illinois Central and the Chicago & Alton from the decision of the United States Circuit Court directing those companies to obey the order of the Interstate Commerce Commission requiring them to take into consideration the privately owned cars and the fuel cars of other companies which may at the time be in use on those lines, in supplying cars to coal companies, were docketed in the United States Supreme Court, Aug. 11.

A head-on collision of limited cars on the Western Ohio Traction Co. line occurred nine miles north of Piqua, Ohio, Aug. 10. It is reported that meeting orders were misunderstood, because of the fact that a seldom-used country switch was indicated as the meeting point, owing to the lateness of one of the cars. Both cars were smashed to kindling wood; three persons were killed and seven were injured seriously. Only one man of the 30 aboard the two cars escaped unhurt.

The New York Up-State Public Service Commission has dismissed the petition of the receiver for the Tarrytown, White Plains & Mamaroneck Railroad asking for permission to increase the fare between White Plains and Mamaroneck from five to ten cents. The railroad's franchise provides that the fare shall not exceed five cents between these two points. The commission prefers that proof of the alleged bad effect of the franchise shall come before it in a different form of proceeding.

The employees in the mechanical department of the Canadian Pacific went out on strike on August 5. It is reported that the strike temporarily closes every shop on the Canadian Pacific system, and it is estimated that upwards of 6,000 men are out. The strike was due to the fact that the employees did not like the findings of the Board of Conciliation, whose report was summarized in the *Railroad Age Gazette* July 31, p. 615. It is an interesting fact that the arbitration in this case was sought by the employees; that the Canadian Pacific management regarded the Board of Conciliation as originally constituted as hostile to its interests, and therefore withdrew its representative from the Board; that the government then appointed an arbitrator to take the place of the one the company had withdrawn, and that it was the Board of Conciliation so constituted that made the report which the road accepted and which the men rejected. In view of these facts, the management of the Canadian Pacific feels confident that it has the support of public opinion in the contest with its employees. The demands of the strikers are as follows: Reduction of hours from ten to nine; abolition of the demerit mark system used in connection with time clocks in the works; that machinists be paid on the 17th instead of the 20th of the month as now; that the company cease alleged endeavors to disrupt the mechanical unions. This strike has come about in spite of the Lemieux act, otherwise known as the Canadian industrial disputes investigation law, which President Eliot last winter characterized as the best piece of labor legislation in the world. The act provides compulsory publicity and investigation of industrial disputes, with an official expression of opinion by the state board of conciliation on the merits of the dispute, but without compulsory arbitration.

Pension Plan for Third Avenue Railroad.

Receiver Whitridge, of the Third Avenue Railroad Co., and affiliated lines, has asked employees between now and October to consider a plan suggested for the formation of a provident association, providing pensions for sickness and death. According to this plan each employee is asked to contribute 50 cents a month to the fund or association, and in return the company, with the consent of the courts and the bondholders, already secured, will agree to put into the fund at the end of each month 50 per cent. of the amount of money contributed by the men if 50 per cent. of the men join the association. If 75 per cent. of the men join the company will put in 75 per cent of the amount contributed by the men, and if 80 per cent. or more of the men join the company will put in 100 per cent. According to the present plan the money so raised will be put into the Central Trust Company, at 54 Wall street, for investment under an agreement with the board of directors of the trust company. It is proposed also to give the men a liberal representation on the board governing the fund, the plans as

outlined calling for a board of seven to be made up of General Manager Edward A. Maher, his assistant, Mr. Roosevelt; the cashier, Mr. Sage; Mr. Snydstrup, and three men to be selected in the first place from the men longest in the company's service, who after the first year's service will then be elected by the members of the entire association.

All the money contributed will be used:

First—To compensate men when they are ill at the rate of $1.50 a day. In the case of serious illness or accident this payment will begin at once. For slight illness or indisposition only after a lapse of five days.

Second—To provide for a payment to the family of a man who dies in the employ of the company.

Third—For the establishment of a pension fund.

The insurance and pension features of the association cannot be expressly defined until it is known how many men will join and what the demands on the association are likely to be.

Valuation of Public Utilities in Missouri.

The Missouri State Board of Equalization has announced the valuation for taxation placed by it for 1908 on the public utility properties in Missouri, including steam railroads, electric railways, bridges and telegraph and telephone properties. The valuation placed on these properties in 1908, as compared with 1907, are as follows:

	1908.	1907.
Steam railroads	$115,857,413	$114,058,437
Street railroads	34,344,650	34,397,634
Bridges	4,711,500	4,711,500
Telegraph lines	2,558,409	3,531,114
Telephone lines	5,652,924	5,236,965
Private cars	.....	313,712
Total	$163,124,897	$161,249,362

Discipline on the Lackawanna.

Local regulations of the Switchmen's Union at Buffalo, N. Y., require three men to a switching crew in the Delaware, Lackawanna & Western yards at Buffalo. After the extra men had left the yard, the other night, one of the men of the switching crew complained of being sick and was allowed to go home. The two remaining men after working a short time refused to work any longer, using the rules of the union as their excuse. The situation was explained to them and they were told to continue to work, but refused and left their engine. They were discharged the next day and the matter was taken up by the union. President Truesdale, having gone over the facts, sustained his subordinates and refused to discuss, with the union, a matter so evidently a question of discipline. The union talked many threats, but nothing has been done.

Protest Against Bosses.

The United States Steel Corporation has issued a set of rules to protect employees from bosses who have been getting money from them and who have been using them for political purposes. One of these rules reads: "No superintendent, foreman, boss or clerk is permitted to solicit money or make collection from workmen for any church, society or association."

Commissioner Clements on Judge Speer's Injunction.

Commissioner Clements, of the Interstate Commerce Commission, is quoted as follows with regard to the rate situation in the South, and to Judge Emery Speer's injunction forbidding, in Georgia alone, the increase of freight charges on hay, grain, meats, etc., which went into effect in Alabama, Florida and the Carolinas on August 1:

"The situation in Georgia seems somewhat complicated. The railroads, in compliance with our regulations, filed their proposed increases on July 1. The new rates went into effect on August 1 in Alabama, Florida and North and South Carolina, but in Georgia the shippers, evidently thinking there was not time to appeal to the commission, had the roads enjoined from operating the rates in that state. The shippers now complain to the commission and ask that the reasonableness of the rates be determined. In my opinion Judge Speer's decision merely enjoins the railroads from collecting the increase in rates until the commission can pass on the question, which we will do as soon as possible.

"But another important question which will undoubtedly be brought out in the investigation is whether the Interstate Commerce Commission has the right to pass on the reasonableness of rates which are not actually in operation. This phase of the law has not yet come before the commission, and although I think we are authorized to decide the reasonableness of rates at any time, this may furnish a nice, technical question."

The Fastest Motor Boat.

On August 4, the motor boat "Dixie II." made a series of four trial runs over the measured course of the New York Yacht Club in Hempstead Harbor, L. I. The course is 1.1 nautical miles long. The boat ran twice with the tide and twice against it. Its average for the four trials was at the rate of 35.74 statute miles an hour, which is the fastest time ever made by a motor boat on officially timed tests, either in this country or abroad. The "Dixie II.," which won the international motor boat race at Huntington, on August 4, was designed by Clinton H. Crane, with engines by Crane & Whitman. It has a single propeller, driven by an eight-cylinder gasolene engine, and can make a trifle more than 800 revolutions per minute, with horse-power of slightly over 200.

How to Catch Freight Car Thieves.

We reprint, verbatim, the following suggestion to the superintendent:

to the general Superintendent of the X. & Y. R R.

Dear Sir pleas excuse me for writing this letter but I write it for what I believe will be to the great atvandage to the X. & Y. R. R. as it I believe save the road hundreds of thousands of dollars every year.

build bridges across every princaple yard on the road. we will say 40 feet or 50 feet high. to build them about 240 rods apart. let them be built clear across the entire yard. then supply each bridge with a serch light and a small track to operate the light from. suply it with a wire to carry the electric current. Suply each bridge with one watchman. each watchman with a powerfull hand field glass. now as the bridge extends clear across the yard. the serch light can be placed in any position, and the watchman can move to a line of all switches and with the aid of the serch light and field glasses can look and see plainly along and between all trains that may be standing on any of the switches. and should he discover any car burgelers or brass thieves, he can immediately notify the chief at once on what switch and right where they are operating.

and eventualy car burgelers and brass thieves will have to hunt some other field to operate.

New Hampshire and Its Railroad.

R. W. Pillsbury, of Londonderry, New Hampshire, candidate for the Republican governorship nomination in that state, has sent a letter to members of the party in which he declares that the Boston & Maine is active in the canvass, and pledges, if nominated and elected Governor, to use his influence to prevent the railroad from interfering in political affairs. He says: "The political machine directed by President Tuttle, aided by Railroad Commissioner Putney, and under them a small army of attorneys, lobbyists, etc., has determined to crush out all opposition. They opposed and defeated in the last legislature the progressive policies of the platform. They have selected for the Republican party a candidate for Governor. They are fighting for the life of their political machine. They have a most powerful organization. President Tuttle, just before the meeting of the legislature last year, frankly declared his political understanding that platform utterances and subsequent legislative enactments are to be regarded as 'quite different things.' If elected to the high honor, I pledge every influence at my command to prevent interference in our political affairs by the managers of the Boston & Maine. I pledge every effort for the enactment of a law that shall re-

quire the railroad corporation to pay taxes at a rate equal to that assessed upon the property of the farmer, the house owner and the shop keeper, putting an end to the favoritism enjoyed by the railroad for more than a score of years."

Mr. Pillsbury has written a letter to President Tuttle demanding that, in the interests of public policy, he furnish a list of the free passes issued by the road with the names of the holders. Mr. Tuttle answered by denying that his road was taking part in politics, or that any persons were being influenced in New Hampshire by the gifts of free passes, adding that it would be improper for the Boston & Maine to issue a campaign document for the benefit of any candidate for a political office.

Mayor Johnson's Cheap Transportation.

The Municipal Traction Co., the holding company by means of which Mayor Johnson evades the intent of the Ohio law forbidding municipal ownership of street railways, has accumulated a deficit of $80,000 in two months in its efforts to pay a 6 per cent. rental on the $14,000,000 property of the Cleveland Electric under the 3-cent fare régimé. Mayor Johnson has been endeavoring to modify the franchise requirement and give fewer free transfers, but the councilmen have refused to aid him in this. The Mayor now issues a long statement, saying that the company has been losing $1,000 a day through the inability of the conductors to make three-cent change rapidly, and he announces that cash fares will hereafter be five cents, but that passengers can buy five aluminum disc-tickets for 15 cents.

Mail Clerks Held Responsible.

The post-office department has issued the following bulletin holding railroad mail clerks responsible for injuries to persons caused by throwing mail from moving trains:

The number of cases reported lately wherein persons have been injured while standing on depot platforms by mail thrown from moving trains renders it necessary to take some decisive action in conformity with the instructions in regard to delivering mails at catch stations.

Hereafter every case wherein persons are injured by mails thrown from trains will be rigidly investigated, and the clerk who delivered the pouch held strictly responsible.

There should be a place designated at each station for the delivery of the mails, and the clerk charged with the responsibility of attending the door should see to it that the mail is delivered at that point and nowhere else. The usual excuse that the clerk did the best he could, will not be accepted in cases where the instructions are not complied with and persons thereby injured.

Several railroad companies have expressed the intention of taking legal means to have the clerk responsible for the damage joined with the company in all suits brought against the company by persons injured by careless delivery of mail.

Shop Employees' Strike on the Iowa Central.

The places of all the striking shop employees of the Iowa Central Railway, who went out on April 22, have been filled, very few of the men who struck having returned to work. The schedules under which these men were working were on August 1, 1907, made subject to 30 days' notice from either party in case a revision was desired. Shortly thereafter, committees representing the machinists, boilermakers and blacksmiths, and the helpers in each class, notified the officers not only of the Iowa Central, but of the other roads in this territory, of their desire for a revision of the schedules, with an advance in pay. The schedules of the other roads did not expire for some time after those of the Iowa Central, but one road, the Chicago Great Western, offered increased rates, which were the same as the Iowa Central finally agreed on with its men. The Great Western's offer was rejected by its men and a strike resulted.

Shortly after the Iowa Central had completed the revised schedules, the business depression occurred and the increases that had been asked of the other roads were either refused by the roads or withdrawn by the men. Having already revised its schedules, the Iowa Central was thus paying higher rates to its shop employees than any other line in the territory was paying to men similarly engaged. The road, therefore, gave the men 30 days' notice of its desire to revise the rates, and meetings were held in April. By direction of the officers of the organizations, the men refused to consider an adjustment that would reduce the rates to the level of those paid by neighboring lines, and the strike resulted, all of the shop employees on the line going out. The company has had no further discussion of the matter with the men since the day they struck, and has made permanent arrangements to retain the men who took their places.

Refrigerated Staterooms.

The United Fruit Co. has put in commission on its route between New Orleans, Colon and Honduras, the passenger steamer Cartago, built at Belfast, which has all its staterooms equipped with pipes connecting with the refrigerating plant, so that passengers can keep their rooms at whatever temperature they desire. A dial in each room enables the passenger to explain to the machine how cold he wants to be.

Traffic News.

The Car Service Association of Mexico has been abolished, and demurrage now has to be taken care of by the individual members.

The St. Louis, Iron Mountain & Southern has been fined $2,000 for failing to provide negro passengers with accommodations as good as those furnished to its white patrons.

Convicted of violating the Anti-pass law, Conductor Watts, a brakeman on the Great Northern in Montana, was fined $600 on August 6, and Gertie Williams, who received the pass, was fined $100.

According to most recent advices, trains on the St. Paul extension will enter Butte some time this month, and the line will be opened to Seattle early in 1909. It is reported that the company now has 2,000 men at work in Montana.

It has been freely stated in the newspapers that the Baltimore & Ohio has made arrangements to use the Wabash terminal at Pittsburgh for its passenger trains. An officer of the Baltimore & Ohio says that this report is entirely without foundation.

The Transportation Committee of the Buffalo Chamber of Commerce has asked the Board of Trustees to advise the railroad companies, before putting proposed advances in freight rates into effect, to submit the question to a conference of the leading shippers of Buffalo.

Loaded car movement on the New York Central western lines in July was 703,167 carloads, a decrease of 92,146; Lake Shore loads decreased 34,411; Big Four loads decreased 22,754, and Michigan Central loads decreased 26,748. On all these lines the movement of empties increased.

The crop report issued by the Canadian Census Bureau, August 11, estimates the yield of wheat for all Canada at 130,263,000 bushels; oats, 269,254,000 bushels; barley, 51,690,000 bushels, and hay, 8,780,000 tons. The heat and drought in July lowered crop conditions all over Canada.

The Chicago & Alton has appointed J. W. Guttery, for many years dining car conductor on the Burlington, as dining car inspector of the Alton-Clover Leaf system. His duties will be to inspect the dining car service and recommend improvements where he thinks they should be made. He will spend his entire time on the road and will make a personal observation of the operation of the dining car and cafe services on all trains.

Eben E. MacLeod, Chairman of the Western Passenger Association, has notified Norman E. Mack, Chairman of the Demo-

cratic Committee, that no special reduced rate will be made for the notification at Lincoln, Neb., on August 12, of William J. Bryan of his nomination for President. This is in harmony with the policy of the western lines to maintain the legal passenger fare of 2 cents per mile. Mr. Bryan is said to regard the situation with the utmost cheerfulness.

On August 9 attorneys for the Arkansas Railroad Commission began the compilation of rates within the state showing the expenses and receipts, both passenger and freight, for the past year. These statistics are to be used in fighting the injunctions asked for by the Arkansas railroads to nullify the 2-cent freight and passenger rate promulgated by the commission. The hearing will be before Judge Vandeventer in St. Paul, August 31.

On August 9 the National Travelers' Association of America was organized at Milwaukee, Wis., and the headquarters of the association was located in Milwaukee. The objects of the organization are "to bring about a better acquaintance of persons engaged as commercial travelers, to secure equitable rates on all lines of transportation, to obtain equitable allowances of baggage and to secure hotel accommodations commensurate with the prices paid." Frederick L. Gross, of Milwaukee, is president.

The International & Great Northern and the Chicago, Rock Island & Gulf have filed with the Texas commission the required statement of passes issued during the year. The Chicago, Rock Island & Gulf issued 19,719 passes for a total of 1,037,647 miles, while the International & Great Northern issued 22,644 passes for 7,989,698 miles. In the year ending June 30, 1907, the Chicago, Rock Island & Gulf issued transportation for 3,589,098 miles, and the International & Great Northern for 9,608,811 miles.

The Oklahoma Corporation Commission has issued an order for a reduction in freight rates on vegetables, canned goods and fruits. The rates per 100 lbs. fixed range from 4, 5 and 6 cents for five miles and under to from 5 to 31 cents for 300 to 400 miles. The order provides that in cold weather when the articles are liable to damage from frost passes may be issued to caretakers. Only one waybill is to be issued covering the entire movement of any carload. Through billing must be made from point of origin to destination and bill of lading and waybill must show full address of the consignor.

The National Dry Goods Association is circulating for signatures a protest to be made to the railroads about rate increases. This petition contends that legislation against rebates has amounted virtually to an advance in rates; that by means of reclassification a very general advance in rates has been made; that dry goods have for years been paying an undue share; that all mercantile and manufacturing companies have suffered as much shrinkage in earnings as the railroad companies have; that there is no reason why railroads should charge their deficiencies upon the shipping community at a time like the present, and that the proposed advance would be unsound economically.

The Atchison, Topeka & Santa Fe pleaded guilty in the United States District Court at Chicago on August 7 to having granted rebates to the United States Sugar & Land Company of Garden City, Kan., and was fined $7,000 by Judge Bethea. The Santa Fe agreed to give the United States Sugar & Land Company a bonus of $50,000 to aid in the construction of its plant at Garden City, where the Santa Fe is the only railroad, and $11,000 of this had been paid. The indictment contains 65 counts and all were nolle prossed when the plea of guilty on one count was entered. Counsel for the government recognized the fact that if the railroad had violated the law the violation was merely technical and a compromise was effected by counsel for the railroad and counsel for the government.

The estimated value of the produce shipped last month from points on the West Jersey & Seashore, in the six lower counties of New Jersey, was $1,178,000, an increase over July, 1907, of $746,800. It took 2,945 freight cars to transport this produce to market. To enable the farmer to market his products quickly and secure the most advantageous prices, special schedules were established, and trains known as "preference freights" were run making time only equalled by passenger trains. The market has also been greatly widened as a result of the development campaign undertaken by the Pennsylvania Railroad in behalf of the commercial and agricultural interests of southern New Jersey. During the winter, commission merchants and buyers all over the country were supplied with lists of reliable growers and shippers in that section. About half of this produce, 1,232 cars, went to Jersey City and New York. Philadelphia and Camden took 443, Boston 258, Buffalo 127, Pittsburgh 249, Chicago 34, Indiana 4, Kansas 3, Michigan 2, Ohio 68, Rhode Island 27, Connecticut 30, New Hampshire 27, Maine 2, Massachusetts points (other than Boston) 68, and Canada 19.

The joint committee appointed by the railroads and shippers of St. Louis to consider the question of expediting the settlement of freight claims, which is composed of freight claim agents of the railroads and traffic managers of some of the large industrial concerns, has made recommendations that have been issued in a circular by the Freight Bureau of the St. Louis Business Men's League. The committee suggests that if shippers will file their claims direct with the freight traffic officers designated by the railroads considerable delay, incidental to the forwarding of the claims by the railroad representatives receiving them to the proper officer, will be avoided and more prompt attention will be given to the claims. The committee recommends that shippers refrain from prosecuting their claims through freight claim collection agencies and that they deal directly with the railroads. In order to prevent the necessity of papers being referred to destination agents for records, thereby delaying settlements, it is recommended that consignees be asked to furnish the necessary evidence in support of claims, such as advices from railroad agents in cases of shortage of entire packages; similar evidence or notations on paid freight bills in the case of shortages from packages or damage to property; and necessary certificates of weights in connection either with loss, damage or overcharge claims. All claims of whatever nature, the committee says, should be supported by original signed bills of lading or shipping tickets and the paid freight bill. The committee further recommends that tracers for unsettled claims shall be filed with the same officers monthly in the manner indicated, on a form which is printed in the circular, but only after a lapse of 60 days following the filing of claim papers.

INTERSTATE COMMERCE COMMISSION.

A State Rate Considered in Determining an Interstate Rate.

Corn Belt Meat Producers Association v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Prouty.

The complainant represents the live stock interests of the state of Iowa, and prefers two complaints. First that the defendants do not grant the feeding-in-transit privilege in the state of Iowa, which is given in the territory west of the Missouri river, and secondly that the rates upon live stock from Iowa points to Chicago are excessive. To facilitate the handling of cattle brought in from the range, the railroad company, in territory west of the Missouri river, has permitted the cattle to be stopped off and fattened. When sent on to the market the through rate was charged plus some additional charge for the privilege and plus also the local rate from the feeding point for the additional weight which the cattle have taken on in the process of fattening. Although the feeding-in-transit privilege is not as important to cattle interests of Iowa as it is to those of the territory west of the Missouri river, still the commission holds that the Iowa cattle men should be given the feeding-in-transit privilege.

Rates upon live stock from Iowa points to Chicago are not unreasonable, but the grouping should be revised as at present it apparently discriminates against Iowa points. The complainant in his argument compares the rate from Iowa to Chicago on cattle, with the rates for a similar distance on cattle to Chicago made by the Wisconsin State Commission. When the commission is asked to examine the reasonableness of an interstate rate, similar rates established by state authority in that territory must have great influence, especially where they have been long agreed to by carriers, still these state rates are not in the least binding upon the commission. The commission has no authority to establish general rate

schedules; what it takes off in one place it cannot add in some other. The rate attacked must be so out of proportion to other rates as to be unreasonable or to discriminate.

STATE COMMISSIONS.

New York. Facilities for Transfer Company at Stations.

J. B. Troy and F. G. Everts v. the Lehigh Valley. Opinion by Commissioner Decker.

The complaint asks that the railroad company be compelled to give the complainants the right to conduct the business of baggage agent in their station in Ithaca, N. Y. The courts have always held that a railroad company cannot be compelled to afford facilities for a baggage and transfer agent in its stations. The commission holds that the Lehigh Valley may make an exclusive contract with any transfer agent to handle the business in this station, but where such an exclusive contract is made the carrier must incur responsibility for the action and abuses of the transfer company.

Wisconsin. Rates on Milk and Cream.

Frank Shultis et al. v. Chicago, Milwaukee & St. Paul; John Winkler v. the same.

In re investigation by the Commission as to rates charged for the transportation of milk and cream, by the Chicago & North-Western and other roads.

The complaints alleges excessive rates on milk and cream. It was found that the rates charged for the transportation of milk and cream were somewhat higher than the rates charged for the transportation of other commodities under like conditions and where the cost of transportation is the same. The cost of transportation of butter is relatively much greater when shipped in the form of cream than when shipped as butter, because the proportion of dead weight is much greater in the former case than in the latter. The value of the products is one of the elements which should be considered in fixing rates and since cream is worth much more than milk it should be charged for at higher rates. The class of service that is furnished by the carriers may also be a factor that should be taken into consideration in the adjustment of rates. Taking all these considerations into account the rates on milk and cream should be reduced.

General Review of Crop Conditions.

On August 1 crop conditions in the United States were in the aggregate some 2 per cent. better than a year ago, but 1 per cent. below a 10-year average condition on that date. Of the crops that are above the average may be mentioned winter wheat, hay, cotton and tobacco. Corn, barley, rye, buckwheat, apples and flax are slightly below the average, potatoes above 5 per cent. below, and oats nearly 10 per cent. below the average.

In the North Atlantic states general conditions are slightly better than a year ago and slightly below the 10-year average condition on August 1. Corn, wheat and apples are slightly to moderately above the average condition, while hay, potatoes, oats, rye, buckwheat and barley are below; the deficiency in condition of potatoes is about 10 per cent., and of hay about 4 per cent. In the North Central states which are east of the Mississippi river, general crop conditions are about 1 per cent. below a year ago and about 4 per cent. below the average. Corn is about 7 per cent. below, oats 18 per cent. below, potatoes 4 per cent. below, apples 20 per cent. below, and tobacco 6 per cent. below the average. Hay is good, being about 10 per cent. above the average; wheat, barley, rye and grapes are slightly above, and peaches are about 50 per cent. above the average.

In the North Central states west of the Mississippi river, crop conditions in the aggregate are practically the same as the 10-year average and nearly 3 per cent. better than a year ago. Hay alone of the important crops is materially above (14 per cent.) the average; rye is slightly better, and peaches about 40 per cent. better than the average. Practically all the other important crops show a more or less lower condition than the average, corn being about 2 per cent., wheat 2 to 3 per cent., oats 6 per cent., flax 2 per cent., barley 3 per cent., and apples 20 per cent., respectively, below. The condition of potatoes is about the average.

In the South Atlantic states crop conditions are favorable, being about 4 per cent. better than a year ago and nearly 5 per cent. above the average. Rice and potatoes are the only ones of the important crops which are below their 10-year average. The relative betterment of the other important crops above their average is: cotton 5 per cent., corn 3 per cent., hay 10 per cent., wheat 4 per cent., tobacco 6 per cent., sweet potatoes nearly 1 per cent., apples 25 per cent., peaches 40 per cent., and oats 4 per cent. In the South Central states also conditions are favorable, being about 8 per cent better than a year ago and 2 per cent. better than the average. Cotton, the most important crop, has the same condition as the 10-year average. Corn is 3 per cent. above the average, hay 8 per cent., wheat 6 per cent., tobacco 5 per cent., sweet potatoes, oats and rice each 4 per cent., and peaches 10 per cent., respectively, above their average condition. Apples are 12 per cent. below, and potatoes, sorghum and sugar cane are each slightly below the average condition.

In the Far Western states conditions are not so favorable, being about 5 per cent. below a year ago and nearly 5 per cent. below the 10-year average condition. Nearly all the important crops are below the average. Peaches, however, are about 15 per cent. better, and grapes slightly better. The approximate extent of deficiency in the condition of other crops is: hay 8 per cent., wheat 6 per cent., barley 8 per cent., oats 4 per cent., potatoes 5 per cent., and apples 1 per cent.

The condition of crops investigated by the Department of Agriculture is given herewith:

Crops.	Aug. 1, 1908.	July 1, 1908.	Aug. 1, 1907.	10-year average.
Corn	82.5	82,8	82,8	83.1
Winter wheat (yld. bu.)	14.3	...	14.6	14.1
Spring wheat	80.7	89.4	79.4	82.7
Oats	76.8	85.7	75.6	83.8
Rye	88.5	91.2	88.9	88.4
Barley	83.1	86.2	84.5	85.7
Buckwheat	89.4	...	91.9	91.5
White potatoes	82.9	89.6	88.5	86.8
Sweet potatoes	88.8	89.8	85.7	87.2
Tobacco	85.8	86.6	82.8	82.3
Flaxseed	86.1	92.5	91.9	88.0
Rice	94.6	92.9	...	90.7
Hay (all tame)	92.1	92.6	87.0	...
Timothy	89.8	90.2	88.5	88.7
Clover (production)	96.6	...	74.7	82.1
Alfalfa	88.8	86.1	88.7	...
Millet	86.3	87.8	87.6	...
Pastures	86.4	94.6	91.7	89.9
Kaffir corn	86.5	85.3	85.6	...
Tomatoes	84.5	89.4	85.7	...
Cabbage	84.5	88.3	89.4	...
Onions	88.4	90.3	90.5	...
Beans (dry)	88.0	90.0	89.3	...
Beans, Lima	86.4	90.6	85.1	...
Apples	52.2	57.6	39.4	55.9
Peaches	67.1	69.7	33.3	52.4
Grapes	87.1	87.9	84.5	85.6
Pears	70.6	69.7	...	...
Watermelons	79.5	81.4	78.2	...
Cantaloupes	80.1	82.7	74.9	...
Oranges	89.1	91.4	81.9	...
Lemons	93.0	92.9	90.7	...
Hemp	77.4	80.4	88.1	...
Broom corn	80.8	79.8	86.1	...
Sugar cane	88.3	91.7	92.3	90.1
Sorghum	85.4	87.7	85.3	88.8
Sugar beets	87.3	86.9	92.0	...
Hops	86.4	83.8	88.7	88.6
Peanuts	85.5	88.2	84.9	...
Cotton (July 25)	83.0	81.2	75.0	81.4

Traffic on the Wabash.

F. A. Delano is quoted as follows:

"July was much the best month with us since April, although the grain movement was lighter than usual, and the coal traffic was held up the first eight days of the month on account of a new law, requiring every minor to take out a license.

"We are making comparisons with the biggest months in our history and it is pleasing to see the ratio of decrease declining so sharply. When the final figures are in, I expect to find the July decrease not more than 15 per cent. Passenger business is satisfactory. Wabash traffic usually begins to pick up early in June, and continues gaining until it reaches its maximum about the end of September or the middle of October.

"The Wabash can take care of itself without the Wheeling & Lake Erie, the loss of which would have no appreciable effect on traffic operations. Under normal conditions the Wheeling & Lake Erie can take care of itself, too."

REPORT OF EARNINGS AND EXPENSES OF RAILROADS.

MONTH OF JUNE, 1908.

(See also issue of August 7.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	All other revenue from transportation.	From operations other than transportation.	Total operat'g revenues.	Operating expenses: Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total operating expenses.	Net operating revenues (or deficit).	Taxes.	Operating income (or loss).
Alabama Great Southern	309	$177,665	$85,927	$27,547	$177	$291,316	$21,171	$26,411	$6,161	$112,685	$6,816	$173,244	$118,072	$11,429	$106,643
Ann Arbor	301	89,776	43,040	8,920	1,031	142,767	15,415	18,229	2,866	47,773	3,573	87,892	54,875	8,092	46,783
Atchison, Topeka & Santa Fe	7,102	3,545,488	1,513,691	251,275	95,417	5,405,871	736,820	335,167	121,623	1,492,117	117,055	2,802,782	2,603,089	342,201	2,260,888
Atlantic Coast Line	4,367	1,317,608	404,633	118,425	38,300	1,878,966	305,440	330,703	34,719	768,101	63,638	1,502,601	376,365	99,373	276,992
Baltimore & Ohio	4,006	4,085,320	1,040,138	281,262	29,531	5,436,251	891,405	724,883	137,301	2,035,430	97,847	3,886,866	1,549,385	218,168	1,331,217
Bangor & Aroostook	515	126,709	44,264	7,797	8,253	187,023	24,079	17,404	3,179	61,959	9,943	116,565	70,458	.....	70,458
Buffalo, Rochester & Pittsburgh	568	442,641	70,094	9,920	1,679	524,334	47,543	110,459	8,145	138,010	12,775	316,932	207,402	10,248	197,154
Charleston & Western Carolina	341	66,811	20,589	4,336	1,291	93,027	30,642	20,057	2,685	47,792	2,974	104,150	‡11,123	171	*11,294
Chicago, Indiana & Southern	329	185,416	16,187	4,611	1,211	207,425	52,084	23,442	7,138	85,461	†2,906	165,219	42,206	15,000	27,206
Chicago Milwaukee & St. Paul	7,516	2,859,502	1,134,789	362,855	34,119	4,391,265	522,372	444,042	115,647	1,578,653	74,763	2,735,477	1,655,788	197,798	1,457,990
Chicago, Rock Island & Gulf	472	104,917	48,509	11,484	384	165,294	41,733	†1,916	5,900	86,267	7,448	139,432	25,862	7,710	18,152
Cincinnati, New Orleans & Texas Pac.	338	438,311	122,254	35,063	342*	595,286	46,564	90,280	16,640	211,560	16,936	381,980	213,306	23,002	190,304
Cleve., Cin., Chicago & St. Louis	1,983	1,183,693	592,023	167,243	13,987	1,956,946	226,043	267,263	68,815	809,589	33,123	1,404,833	552,113	65,462	486,651
Colorado & Southern	1,248	448,532	130,715	36,247	2,679	618,173	96,146	87,277	14,317	203,271	24,827	425,838	192,335	20,506	171,829
Colorado Midland	338	112,801	33,501	18,094	570	164,966	14,022	16,190	9,446	60,800	5,372	105,830	59,136	8,400	50,736
Denver & Rio Grande	2,501	1,101,752	418,434	65,935	6,176	1,592,297	156,134	200,895	33,919	473,205	48,432	912,585	679,712	64,470	615,242
Detroit, Toledo & Ironton	486	91,413	12,717	6,040	1,249	111,419	2,869	25,741	2,411	47,681	3,193	81,895	29,524	6,745	22,779
Duluth, South Shore & Atlantic	593	107,127	78,626	12,753	1,841	200,347	52,533	25,438	8,050	72,309	5,576	163,906	36,441	10,353	26,088
Great Northern	6,643	2,462,273	927,369	234,316	33,208	3,657,166	1,346,176	444,073	51,845	1,080,581	78,808	3,001,483	655,683	165,839	489,844
Gulf, Colorado & Santa Fe	1,518	368,685	178,046	39,871	5,502	592,104	108,164	81,491	21,377	318,052	22,958	552,042	40,062	33,730	6,332
Iowa Central	558	169,027	41,898	9,729	941	221,595	38,901	46,205	9,093	89,113	8,102	191,414	30,181	7,339	22,842
Lake Shore & Michigan Southern	1,508	1,785,136	831,343	370,747	17,164	3,004,390	501,368	452,280	90,793	990,074	62,548	2,097,063	907,327	109,999	797,328
Minneapolis & St. Louis	1,028	173,715	93,183	20,483	886	288,267	29,160	35,312	8,258	106,331	9,301	188,362	99,905	13,245	86,660
New York Central & Hudson River	3,588	3,813,232	2,374,331	629,703	57,472	6,874,738	1,054,536	824,918	164,768	2,567,374	135,683	4,747,279	2,127,459	296,595	1,830,864
New York, Chicago & St. Louis	553	486,957	120,309	20,210	4,637	632,113	70,721	76,482	47,006	260,686	13,705	468,600	163,513	42,858	120,655
Peoria & Eastern	352	146,931	53,307	15,209	662	216,109	28,063	26,256	4,215	90,766	4,420	153,720	62,389	9,507	52,882
San Antonio & Aransas Pass	724	206,641	68,295	15,960	4,073	294,969	47,501	30,084	4,241	107,249	5,036	194,111	100,858	10,757	90,101
San Pedro, Los Angeles & Salt Lake	1,099	331,189	238,885	30,410	5,275	605,759	62,176	84,535	22,525	192,279	24,426	385,941	219,818	19,665	200,153
Santa Fe, Prescott & Phoenix	257	74,140	26,888	3,164	3,814	108,006	21,805	7,069	1,830	25,481	4,082	60,267	47,739	.....	47,739
Southern Ry.	7,514	2,510,821	1,087,826	350,569	23,445	3,972,661	437,803	536,923	106,659	1,606,212	115,978	2,803,575	1,169,086	169,540	999,546
Texas & Pacific	1,885	511,630	263,275	58,254	8,274	841,433	153,589	122,077	16,226	415,118	29,783	736,793	104,640	28,000	76,640
Texas Central	268	27,233	23,915	4,699	303	56,150	25,847	12,169	1,068	37,531	3,043	79,658	‡23,508	1,969	*25,477
Toledo & Ohio Central	441	293,506	50,088	11,563	552	355,709	51,494	†3,114	5,199	98,605	5,223	157,407	198,302	13,393	184,909
Wisconsin Central	1,023	395,126	133,777	29,665	2,429	560,997	103,755	69,643	20,749	193,786	16,964	404,897	156,100	23,366	132,734
TWELVE MONTHS OF FISCAL YEAR, 1908.															
Alabama Great Southern	309	$2,258,557	$998,297	$290,433	$4,214	$3,551,501	$477,647	$795,234	$87,379	$1,342,014	$83,900	$2,786,174	$765,327	$131,904	$633,423
Ann Arbor	301	1,302,621	462,895	105,068	12,198	1,882,782	220,332	349,524	34,265	767,682	34,622	1,406,425	476,357	136,425	339,932
Atchison, Topeka & Santa Fe	7,102	51,375,455	17,946,659	5,471,958	780,309	75,574,381	11,297,835	11,868,811	1,494,282	22,132,246	1,307,455	48,100,629	27,473,752	2,789,919	24,683,833
Atlantic Coast Line	4,367	17,739,172	6,279,584	1,649,157	311,139	25,979,052	3,824,474	4,224,107	432,786	9,968,329	656,427	19,106,123	6,872,929	1,072,052	5,800,877
Baltimore & Ohio	4,006	55,681,786	13,736,107	3,643,541	547,347	73,608,781	10,892,062	12,584,073	1,669,405	27,763,097	1,242,242	54,150,879	19,457,902	2,027,299	17,430,603
Bangor & Aroostook	515	1,809,435	594,993	95,756	280,898	2,844,082	432,831	267,967	35,320	955,553	108,150	1,799,821	1,044,261	14,937	1,029,324
Buffalo, Rochester & Pittsburgh	568	6,338,934	939,834	127,055	16,413	7,422,236	968,349	1,557,152	95,773	2,389,041	143,903	5,154,218	2,268,018	175,248	2,092,770
Charleston & Western Carolina	341	1,050,833	269,774	72,214	15,318	1,408,139	288,984	221,630	31,921	589,597	33,480	1,165,612	242,527	49,671	192,856
Chicago, Indiana & Southern	329	2,443,439	194,756	58,784	15,147	2,712,126	449,715	331,565	87,192	1,128,450	88,285	2,085,207	626,919	94,761	532,158
Chicago Milwaukee & St. Paul	7,516	40,426,880	11,883,395	4,213,791	408,554	56,932,620	6,642,820	7,039,270	1,281,683	21,360,567	839,028	37,163,368	19,769,252	2,304,962	17,464,290
Chicago, Rock Island & Gulf	472	2,198,783	698,223	134,502	12,163	3,043,671	469,973	277,266	79,763	1,217,444	85,923	2,130,369	913,302	81,847	831,455
Cincinnati, New Orleans & Texas Pac.	338	5,824,309	1,555,173	374,396	8,509	7,862,378	660,628	1,880,023	198,477	2,976,854	,183,416	5,899,398	1,962,980	221,002	1,741,978
Cleve., Cin., Chicago & St. Louis	1,983	15,473,752	6,789,744	2,240,837	225,924	24,730,257	3,222,669	3,994,675	851,548	10,494,657	473,249	19,036,798	5,693,459	791,252	4,902,207
Colorado & Southern	1,248	6,421,767	1,605,785	418,174	45,806	8,491,532	1,144,806	1,436,794	171,502	2,775,438	292,099	5,820,639	2,670,893	238,734	2,432,159
Colorado Midland	338	1,585,781	363,963	243,234	7,777	2,200,755	322,869	281,546	115,569	889,287	61,821	1,671,092	529,663	102,833	426,830
Denver & Rio Grande	2,501	14,369,568	5,119,190	809,548	88,125	20,386,431	2,207,697	3,168,744	444,950	6,729,470	487,948	13,038,809	7,347,622	750,471	6,597,151
Detroit, Toledo & Ironton	486	1,365,216	162,845	82,234	12,971	1,623,266	276,791	404,337	27,075	756,586	33,250	1,498,039	125,227	83,746	41,481
Duluth, South Shore & Atlantic	593	1,783,170	969,126	147,591	22,029	2,921,916	561,404	351,855	85,274	1,136,354	71,328	2,206,215	715,701	186,345	529,356
Great Northern	6,643	40,319,341	11,192,461	2,664,673	215,997	54,392,472	10,047,197	7,915,717	731,834	16,695,546	765,522	36,155,816	18,236,656	2,292,396	15,944,260
Gulf, Colorado & Santa Fe	1,518	7,778,228	2,563,883	581,966	77,876	11,001,053	1,782,779	2,048,248	252,850	5,083,265	307,404	9,474,546	1,527,407	377,150	1,150,257
Iowa Central	558	2,383,816	479,987	126,614	12,058	3,002,475	386,402	346,427	102,377	1,199,190	94,592	2,128,988	873,487	86,843	786,644
Lake Shore & Michigan Southern	1,508	26,722,390	9,237,767	4,471,372	245,855	40,677,384	5,787,388	5,152,284	1,055,389	14,182,104	697,405	26,874,570	13,802,814	1,363,528	12,439,286
Minneapolis & St. Louis	1,028	2,555,133	1,003,377	246,038	21,968	3,826,516	461,761	501,999	111,555	1,455,492	118,112	2,648,919	1,177,597	167,426	1,010,171
New York Central & Hudson River	3,588	50,873,545	27,365,193	7,704,072	884,878	86,827,688	12,229,489	13,079,908	2,123,395	36,427,369	1,701,944	65,562,105	21,265,583	3,407,016	17,858,567
New York, Chicago & St. Louis	553	7,832,523	1,499,855	308,015	32,893	9,673,286	778,340	1,174,139	529,547	3,910,575	152,728	6,545,329	3,127,957	323,437	2,804,520
Peoria & Eastern	352	1,955,870	655,513	196,998	16,010	2,824,391	386,906	409,808	56,131	1,175,665	53,708	2,082,218	742,173	97,096	645,077
San Antonio & Aransas Pass	724	2,149,741	810,559	172,806	24,866	3,157,972	541,867	342,888	48,747	1,202,018	104,268	2,239,788	918,184	128,557	789,627
San Pedro, Los Angeles & Salt Lake	1,099	4,425,697	2,690,359	315,624	86,831	7,518,511	1,526,206	1,127,439	281,942	2,876,821	185,610	5,998,018	1,520,493	244,663	1,275,830
Santa Fe, Prescott & Phoenix	257	1,023,909	336,096	53,895	25,582	1,439,482	321,715	114,218	25,625	335,505	55,850	852,913	586,569	.....	586,569
Southern Ry.	7,514	34,171,329	14,315,961	4,152,873	301,553	52,941,716	7,109,173	9,138,378	1,300,233	20,773,253	1,533,685	39,854,722	13,086,994	2,027,967	11,059,027
Texas & Pacific	1,885	9,549,644	3,690,102	906,922	128,816	14,275,484	1,770,078	2,347,478	201,223	6,196,814	395,611	10,911,204	3,364,280	562,068	2,802,212
Texas Central	268	552,534	379,784	68,929	7,920	1,009,167	247,291	152,093	10,834	379,165	36,623	826,006	183,161	24,242	158,919
Toledo & Ohio Central	441	3,452,455	609,082	119,611	10,850	4,191,998	591,342	661,670	62,321	1,411,150	59,724	2,786,207	1,405,791	155,188	1,250,603
Wisconsin Central	1,023	5,323,931	1,538,311	413,544	31,525	7,307,311	848,054	1,040,762	252,587	2,764,502	224,738	5,130,643	2,176,668	318,380	1,858,288

*Loss. † Credit. ‡Deficit.

Business Conditions Throughout the Country.

The L. Schepp Company recently addressed a letter to wholesale grocers, biscuit bakers and confectioners throughout the country, asking them to fill in blanks reporting the business of their section for the half year, compared with the corresponding six months in 1907. Reports by sections follow:

Eastern States—Pennsylvania, New York, Vermont, Rhode Island, Maine, New Hampshire, Massachusetts and Connecticut.

Grocery articles:
- Falling off in staples ..... 10¾ per cent.
- Falling off in luxuries..... 16 "

Biscuits and bakers' articles:
- Falling off in staples ..... 8½ "
- Falling off in luxuries..... 16¾ "

Confectioners' articles:
- Falling off in staples..... 7½ "
- Falling off in high priced confectionery.... 17½ "

Collections on the above about 8 per cent. slower, with quite a number of extensions required.

Southern States—All States South of Pennsylvania and Ohio.

Grocery articles:
- Falling off in staples ..... 11 per cent.
- Falling off in luxuries ..... 18 "

Biscuit and bakers' articles:
- Falling off in staples..... 10 "
- Falling off in luxuries ..... 15½ "

Confectioners' articles:
- Falling off in staples..... 9½ "
- Falling off in high priced confectionery.... 18½ "

Collections on the above about 8 per cent. slower, with quite a number of extensions required.

Middle West—To and Including the Mississippi Towns.

Grocery articles:
- Falling off in staples..... 9 per cent.
- Falling off in luxuries..... 15 "

Biscuit and bakers' articles:
- Falling off in staples..... 10 "
- Falling off in luxuries..... 18 "

Confectioners' articles:
- Falling off in staples..... 10½ "
- Falling off in high priced confectionery.... 18 "

Collections on the above almost normal, with very few extensions required.

Texas reports 6 per cent. falling off in staple groceries and 8 per cent. in luxuries. Other states between the Mississippi and the Pacific coast give returns of substantially normal business, with some increases.

Freight Car Balance and Performance March, 1908.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting Statistical Bulletin No. 28, covering Car Balance and Performance for March, 1908, says:

"The number of surplus cars continued to show a decrease during this month, the total reported in Bulletins Nos. 19 and 19-A, averaging 306,017, or 14.41 per cent. of all revenue cars reported. The number of bad order cars increased, however, the percentage for March being 7.29 per cent., making a total of 21.7 per cent., or 460,830 idle cars on all reporting roads. Allowing for 5.02 per cent. as the normal number of bad order cars, and adjusting the mileage as in previous bulletins, an average daily mileage of 25.5 per car is obtained. This average, which is within .1 mile of the highest average for more than a year, indicates that good service was being secured from those cars not held on storage tracks.

"In connection with the reports of surplus cars and their effect on the general averages, it should be remembered that fair comparisons cannot be made between the results on individual roads or in the different group averages, without making allowance for the unusual change in car balance during the three months preceding the period covered by this report. Many car owners who had been forced to operate during normal periods with from 75 per cent. to 85 per cent. of the number of cars owned by them, had their percentages increased to 100 per cent. or higher by the return of large numbers of their cars which were no longer profitable to the roads which had been using them. This increase in the number of cars on line not only affected the performance figures for these roads, but also caused them to report larger surpluses than would have appeared had there been no change in the number of cars on line. The change in balance had an opposite effect on the averages of those roads which normally hold cars in excess of their ownership. The surplus reported by roads of this class was lower by from 25 per cent. to 50 per cent. than it would have been if based on the number of cars carried in prosperous times.

"It will be noted that the March report shows the first sign of a break in the steady increase in homeward movement of

Freight Car Efficiency, March, 1908.

Railroad-owned cars:	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned.....	68,799	671,645	279,988	135,613	166,953	371,914	15,916	138,973	24,644	113,724	96,520	2,084,689
Average number system cars on line.	55,435	487,567	214,344	98,928	124,554	292,725	6,257	104,790	17,630	68,036	74,727	1,544,993
Average foreign cars on line.....	24,945	147,494	68,462	30,595	36,720	72,508	8,835	21,748	9,651	37,539	19,404	477,901
Total cars on line	80,380	635,061	282,806	129,523	161,274	365,233	15,092	126,538	27,281	105,575	94,131	2,022,894
Excess	11,581	.....	2,818	.....	.....	.....	.....	.....	2,637	.....	.....	.....
Per cent. cars on line to total owned:												
Home	81	73	77	73	75	79	39	75	72	60	78	74
Foreign	36	22	24	23	22	19	56	16	39	33	20	23
All railroads.	117	95	101	96	97	98	95	91	111	93	98	97
Private cars on line	2,719	40,837	13,975	3,051	6,425	11,219	970	5,087	1,624	11,367	3,472	100,746
Total cars on line	83,099	675,898	296,781	132,574	167,699	376,452	16,062	131,625	28,905	116,942	97,603	2,123,640
Per cent. cars in shop	5.43	6.87	8.35	7.44	6.26	5.81	6.71	13.26	5.92	7.39	5.80	7.29
Number of freight engines owned	1,142	9,875	3,774	2,241	2,497	6,283	445	2,432	558	2,337	2,082	33,666
Av. cars on line per freight engine owned	73	73	79	59	67	60	36	54	52	50	47	63
Total freight cars mileage	39,885,248	454,092,837	167,923,065	75,052,833	109,843,545	256,801,709	18,763,278	80,606,701	19,455,215	96,490,198	78,665,220	1,397,579,849
Average miles per car per day.....	15.5	21.7	18.3	18.3	21.1	22.0	37.7	19.8	21.7	26.7	26.2	21.2
Per cent. loaded mileage	69.9	63.0	62.1	66.6	67.5	71.0	74.2	66.8	61.6	70.3	73.1	66.5
Ton-miles of freight, inc. Co. freight....380,494,450		6,530,507,171	2,214,056,805	949,905,427	1,447,485,430	2,343,308,450	255,673,580	1,024,824,416	189,954,268	1,329,477,716	999,153,522	17,664,841,235
Average ton-miles, including Co. freight:												
Per car-mile	9.5	14.4	14.0	12.7	13.3	13.5	14.1	12.7	10.0	13.8	12.6	13.6
Per loaded car-mile	13.7	22.8	22.6	19.0	17.3	19.6	18.9	20.4	16.3	19.6	17.3	20.6
Per car per day	148	312	264	232	280	306	545	252	219	367	330	290
Gross freight earnings	$6,495,534	$37,887,191	$12,810,658	$7,531,408	$9,771,694	$18,984,980	$2,301,146	$8,536,248	$2,171,918	$12,293,137	$6,273,759	$125,057,673
Average daily earnings: Per car owned.	$3.05	$1.82	$1.48	$1.80	$1.90	$2.14	$4.66	$1.99	$2.87	$3.49	$2.10	$2.02
Per railroad car on line.....	2.61	1.92	1.46	1.88	1.97	2.18	4.92	2.18	2.59	3.78	2.15	2.08
All cars on line	2.52	1.81	1.39	1.83	1.89	2.09	4.62	2.10	2.44	3.41	2.07	1.98

cars, which set in with the earliest appearance of a surplus. While this movement still continued above normal, as indicated by the low percentage of loaded mileage, it was not sufficient to cause any further change in the general car balance. The percentage of cars on their owners' lines remained at 74 per cent., the same figure reported for February, while the proportion of loaded mileage is also unchanged, being 65.5 per cent. for both months. To what extent this result was influenced by the reduction in the per diem rate is problematical, but there is little doubt that many roads were less strenuous in their efforts to rid themselves of foreign cars under a 25 cent rate than they had been when the rate was 50 cents."

The Express Business in Massachusetts.

The Massachusetts Railroad Commission has made public the brief of James F. Jackson, formerly chairman of the commission, in the case of the American Express Company. In the case before the board of complainants were the Boston Merchants' Association, the Boston Chamber of Commerce and the New England Shoe and Leather Association. They admitted the right of the company to a reasonable profit, but demanded from it the largest accommodation at the lowest rates which are consistent with such profits. Mr. Jackson showed that the American Express Company has a capital stock of $18,000,000, an invested surplus of $17,000,000 and pays regular annual dividends of 12 per cent. Most of the former independent express companies which used to do business on Massachusetts railroads, which survive, are doing business under the wing of the two great companies which really control the express business of the state.

Mr. Jackson shows why monopoly permits packages to be handled to the greatest advantage in the restricted space and time available on the car and the station when the work is done under one authority. Competitive agencies would mean confusion and delay. Hence it has been the settled policy of the state to discourage competition in express service on passenger trains. Mr. Jackson reviews in detail the defense of the express company and holds that this company is a common carrier and under obligation to the public, no matter whether it is a joint stock company, a partnership, a corporation or an individual.

Mr. Jackson says that the increase of rates made by the American Express Company in January, 1907, was a bolt out of a clear sky, amounting to 66 per cent. and 100 per cent., according to the weight of parcels. Packages upon which the charge had been 15 cents were now to cost 25 or 30 cents. Mr. Jackson says that the "company has utterly failed to prove that the burden is upon it to prove that there have been actual losses in the intrastate business which necessitated this advance in rates."

Mr. Jackson criticised the arrangement between the express companies and the railroad companies. The old custom of paying a fixed price has given way to payment of a percentage of gross receipts. "A questionable sort of partnership has been established which gives the railroad company what may be an undue influence over express rates." The American Express Company pays to the Boston & Maine 35 per cent. and to the New York Central 50 per cent. of the gross receipts. "Possibly it is only a coincidence that the American Express Company has been for many years a very large and influential stockholder in the Boston & Maine, while holding a trifling interest in the New York Central. Mr. Bradley assures us that his company protested vehemently, but without success, against the increases from 40 to 45, and then last July from 45 to 50 per cent. of the receipts from business on the Boston & Albany. * * * But the iniquity of it reaches further. With its well-known thrift, the New York Central has been grasping a larger and larger share of express receipts, until in July last it is safe to assume that it has secured at least all that belonged to it. And yet, under this increase in express charges, with every dollar taken from shippers to make good alleged losses and deficiencies in the express business, another dollar is taken to hand over to the New York Central for the same service for which it has already exacted full compensation under the old rates. News of its new revenue must have been gratefully received at the railroad headquarters."

The estimated additional revenue from this increase in rates, measured by the business of 1907, is $190,789, of which $74,408 would go to the railroad companies. "Whatever equity such an arrangement may have in state or interstate traffic elsewhere, under the conditions of transportation in Massachusetts, and particularly in and around Boston, it is an outrage upon the shipping public. * * * Were every other fact and argument thus far urged to fail, the existence of an agreement which secures to the New York Central 50 per cent. and to other companies a large share of the added revenue from increased charges would in itself arouse a righteous indignation among business men and alone justify the protest against new rates. Express companies, on account of their peculiar understanding and complicated relations with railroad companies, may be willing to submit to their exactions, but the public does not propose to carry the burden for them by paying a tax for which there is no shadow of a justification."

Mr. McCrea on Rate Increase.

President McCrea, of the Pennsylvania, made public on August 11 a letter he had written to the Cleveland Chamber of Commerce in answer to a request for information regarding the probability of an increase in freight rates. Mr. McCrea says:

"There has been at no time any intention, so far as we are advised, of making a general increase in all rates of freight, but consideration has been given to the proposition that an advance might be made in the 'class rates.' These are the rates upon which the high class or miscellaneous merchandise is carried, which constitutes, after all, a small proportion only of the railroad traffic (and, generally speaking, it is the traffic upon which the freight rate is not such an important factor), the bulk of the traffic being moved upon so-called 'commodity rates.'

"Within the past two or three years advances have been made in many commodity rates, with no injurious effect upon business interests, and there has been no substantial complaint roads play in the general prosperity) is as much interested as the owners and managers of railroad property.

"Before deciding as to the possibility and propriety of some advances in these class rates, it was necessary that they should be carefully studied, and the general freight agents and traffic about same.

"Within the past few years, as is well understood, there has been a very great increase in the cost of operation of railroads, due to the increased cost of material and labor, and in order to offset this it would not seem unreasonable for the railroads to expect to secure an advance in the price of the commodity which they have to sell, namely, 'transportation.' Failure, so far, to accomplish this, except to a small extent, combined with the very large falling off in the volume of traffic, has brought the railroads face to face with a very serious problem, in the solution of which the general public (in view of the large part which the prosperity of the railmanagers were instructed to arrange to have a careful analysis made, and this has been in progress for some months. The complications and delicate adjustments surrounding the class rate question required a long period for this analysis. In the meantime there has been much discussion upon the part of merchants, as well as railroad officers, the latter in some cases naturally endeavoring to explain why such an advance was being considered.

"At a recent meeting of the presidents of the Central Freight, Trunk Line and New England Territories, the results of the study at the time were laid before them, and, while the full analysis had not been completed, sufficient information was presented to cause the presidents to feel that it was impossible at this time, and until business conditions materially improved to make any general increase in these class rates. Instructions were given, however, to complete the analysis, which it was believed would be useful at some time in the future, when, under changed business conditions (which it is hoped will not be long delayed), the railroads could probably again give consideration to the matter, if the same high cost of operation should continue.

"While, as stated, it was definitely decided that no general advance in class rates could be made, it was felt that there might be specific cases in which some advances could be properly made at the present time—particularly in commodity

rates, or perhaps in class rates in some particular limited section where the present adjustment was unreasonably low in view of the cost of operation, and as compared with other rates—and the traffic managers are considering the matter further to see if such special cases exist.

"From the above explanation, therefore, you will understand that no general increase such as has been under discussion has been determined upon so far as the lines which I represent are concerned, nor, according to my information, have other lines in the territory in which we operate such intention, but when business conditions materially improve, if the cost of operation continues upon the same high basis as at present, or in the recent past, it will probably be necessary for the railroad companies to again consider advances in their rates."

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Memphis, Paris & Gulf is in the market for a second-hand mogul locomotive weighing from 20 to 30 tons.

The Michigan Central has ordered three Pacific (4-6-2) passenger locomotives from the Montreal Locomotive Works, Ltd.

The Canadian Pacific has ordered ten 10-wheel locomotives to be built at its Angus shops, for delivery in September and October.

The Wheeling & Lake Erie has given a contract to the Lima Locomotive & Machine Works for repairing and rebuilding about 40 locomotives.

The Isthmian Canal Commission, as reported in the *Railroad Age Gazette* of August 7, will receive bids until August 13 for ten 3-ft. 6-in. gage, six-wheel (0-6-0) switching locomotives, for delivery not later than November 1, 1908.

General Dimensions.

Weight, total	80,000 lbs.
Diameter of drivers	30 in. x 42 in.
Total driving wheel base	About 10 ft.
Cylinders	15 in. x 20 in.
Tractive force	15,150 lbs.
Boiler, working steam pressure	160 lbs.
Fuel	Bituminous coal
Coal, capacity	1½ tons
Water capacity	1,000 gals.

Special Equipment.

Couplers	Tower automatic
Lubricators	Detroit
Injectors	No. 7 Monitor
Piston rod packing	Jerome
Valve rod packing	Jerome
Frames	Cast steel.
Valves	Richardson balanced
Valve motion	Shifting link
Cab	Steel

The Eastern British Columbia Railway has ordered two simple consolidation (2-8-0 type) freight locomotives from the Montreal Locomotive Works, Ltd.

General Dimensions.

Weight on drivers	165,000 lbs.
Total weight	184,000 "
Cylinders	20 in. x 28 in.
Diameter of drivers	51 in.
Boiler, type	Extended wagon top
" working steam pressure	210 lbs.
" heating surface, total	2,579 sq. ft.
Tubes, number	360
" material	Steel
" outside diameter	2 in.
" length	12 ft. 9¾ "
Firebox, length	107 "
" width	62¼ "
" material	Steel
Grate area	46.2 sq. ft.
Tank capacity	5,500 gals.
Coal capacity	8 tons

Special Equipment.

Air brakes	Westinghouse-American
Bell ringers	Sanson—M. C. Hammett
Boiler lagging	Magnesia sectional
Brake-beams	Maker not specified
Brake-Shoes	Maker not specified
Couplers	Tower
Headlights	Piper
Injectors	No. 10½, Ohio
Piston and valve-rod packings	United States Metallic
Safety valve	3½-in. Crosby
Sanding devices	Leach
Lubricators	Chicago
Springs	Maker not specified
Steam gage	6¾ in., Ashcroft
Steam heat equipment	Safety Car Heating & Lighting Co.
Tires, driving and truck	Bochumler-Verein, open-h. steel
Wheel centers	Cast steel
Tender truck boxes	McCord

The Central Northern Railway of Argentine has ordered 10 simple, meter-gage, 10-wheel (4-6-0 type) freight locomotives, and 20 simple, meter-gage, Pacific (4-6-2 type) passenger locomotives from the American Locomotive Co.

General Dimensions.

	Freight.	Passenger.
Weight on drivers	66,000 lbs.	79,000 lbs.
Total weight	82,000 "	114,600 lbs.
Cylinders	15 in. x 22 in.	17 in. x 26 in.
Diameter of drivers	43 in.	54 in.
Boiler, type	Belpaire.	Belpaire straight top.
" working steam pressure	170 lbs.	170 lbs.
Heating surface, total	1,058.7 sq. ft.	1,775 sq. ft.
Tubes, number	155	206
" material	Brass.	Charcoal iron.*
" outside diameter	2 in.	2 in.
" length	11 ft. 11⁹/₁₆ in.	15 ft. 8¾ in.
Firebox, length	87⅞ in.	66½ in.
" width	26 in.	53¼ in.
" material	Copper.	Siemins-Martin steel
" maker	Not specified.	Not specified.
Grate area	15.89 sq. ft.	24.5 sq. ft.
Tank capacity	2,650 gals.	4,000 gals.
Coal capacity	10 metric tons.	10 metric tons.

Special Equipment.

Air brakes	Westinghouse-American
Axles	Steel; maker not specified
Boiler lagging	Magnesia, sectional
Brake-beams	Maker not specified
Brake-shoes	Maker not specified
Couplers	Argentine Northern design
Headlights	Maker not specified
Injectors	Simplex; Nathan Mfg. Co.
Piston-rod packing	Trojan; M. C. Hammett
Valve-rod packing	American Locomotive Co.
Safety valve	2½-in. Crosby
Sanding devices (passenger locomotive only)	Leach pneumatic
Sight feed lubricators	Nathan triple bull's-eye
Springs, for driving engine and tender	Siemins-Martin steel
Steam gages	Maker not specified
Tires; driving, truck and tender	Open-hearth steel*
Wheel centers	Siemins-Martin steel; maker not specified
Water gages	Klinger

*Maker not specified.

CAR BUILDING.

The Iowa Central is in the market for 10 caboose cars.

The Wheeling & Lake Erie has appropriated $114,000 for the repair of freight and passenger cars.

The Chicago & North-Western has, it is said, ordered 1,000 freight cars. This item is not yet confirmed.

The Delaware, Lackawanna & Western has ordered 300 steel hopper cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Northwestern Elevated, Chicago, reported in the *Railroad Age Gazette* of June 26 as being in the market for 20 cars, has ordered them from the Pullman Company.

The Panama Railroad, reported in the *Railroad Gazette* of February 21 as being in the market for 300 box cars, has finally ordered them from the American Car & Foundry Co.

The Isthmian Canal Commission, as reported in the *Railroad Age Gazette* of August 7, will receive bids until August 13, for 50 3-ft. 6-in. gage, six-yard, all metal dump cars, ten of which are for delivery on or before November 1, 1908, the remainder on or before January 1, 1909. These cars must have length such as to dump in a space 15 ft. long and the width over all is not to exceed 8 ft. The special equipment includes:

Axles	Open-hearth steel
Brake-beams	Simplex
Brake-shoes	Streetor, steel-backed
Brakes	Westinghouse
Couplers	Tower or Chicago
Draft rigging	Miner tandem
Journal boxes	McCord

The Chicago Railways Co. last spring ordered 650 pay-as-you-enter cars for delivery before January 1, 1909. The 50 cars being built by the Pressed Steel Car Co., as reported in the *Railroad Gazette* of March 27, are of all-steel construction, and the 600 cars ordered from the Pullman Co. will have steel underframes with wooden body covered by steel sheathing. They will have a seating capacity of 40 passengers and weigh 53,000 lbs. The wheel base of the trucks is 4 ft. 10 in., and the cars will measure 20 ft. 1 in. from center to center of

trucks. The cars will be 32 ft. 5 in. long, 8 ft. 2 in. wide and 8 ft. high, inside measurements; 49 ft. 2 in. long, 8 ft. 9 in. wide and 11 ft. 8 in. high over all. The special equipment includes:

Air-brakes	National Brake & Elec. Co.
Center bearings	Barber and Ideal
Control system	G. E. K-35
Curtain fixtures	Acme
Curtain material	Pantasote
Destination signs	Hunter, illuminated
Door fastenings	Pullman
Dust guards	Positive
Fenders	Chic. Ry. Co. standard
Hand brakes	Peacock
Heating system	Consolidated
Headlights	Adams & Westlake
Interior finish	Cherry
Journal boxes	McCord
Motors	G. E., interpole
Roofs	National standard
Safety treads	Mason or Universal
Sanders	Keystone
Side bearings	Woods roller
Springs	Pullman
Trolley poles and attachments	General Electric
Trucks	Pullman No. 150
Paint and varnish	Not decided
Fare registers	International

IRON AND STEEL.

The Cananea, Yaqui River & Pacific has ordered 15,000 tons of rails from the United States Steel Corporation.

The Northwestern Elevated, Chicago, is asking bids on 1,400 tons of structural steel for building its stub terminal.

The Seaboard Air Line has ordered 2,250 tons of bridge steel from the Virginia Bridge & Iron Co., Roanoke, Va.

The Oregon Short Line has ordered 238 tons of structural steel from the Minneapolis Steel & Machinery Co. for a new depot at Salt Lake City, Utah.

Sealed tenders will be received at the office of the Transcontinental Railway, at Ottawa, Ont., until noon on September 1, for 44,447 gross tons of 80-lb. rails and the necessary fastenings.

The Baltimore & Ohio has ordered 14,500 tons of rails, to be divided between the United States Steel Corporation, the Maryland Steel Co. and the Bethlehem Steel Co. Of this tonnage, the latter company will roll 1,200 tons by the open-hearth process. The Maryland company was awarded about 6,250 tons of the order.

RAILROAD STRUCTURES.

ATHOL SPRINGS, N. Y.—The Lake Shore & Michigan Southern will build a bridge 1,560 ft. long. It will be a four-track structure, built of steel and reinforced concrete. Work is to be done by the company's forces.

AVIS, PA.—A. F. Chapman & Co., Buffalo, N. Y., has been awarded the contract for building a brick and steel addition to the roundhouse of the New York Central & Hudson River. The contract price was $50,000.

BEAVER, PA.—It is said that orders have been issued to begin work placing the structural steel for the big bridge of the Pittsburgh & Lake Erie across the Ohio river as soon as possible, instead of waiting until next summer, as originally announced. Work is progressing rapidly on the masonry construction of the piers. The erection of the big bridge and other changes in the Beaver Valley, which will follow, represent, it is said, an expenditure of approximately $3,000,000, including real estate. Contracts for the masonry work, to cost $500,000, were awarded to the Drake Construction Co., and the structural steel contract was awarded to the McClintic-Marshall Construction Co., the latter dividing the order for material between the Jones & Laughlin Steel Co. and the Carnegie Steel Co. About 14,000 tons of steel will be used. (May 29, p. 746.)

BUFFALO, N. Y.—The New York Central & Hudson River has completed plans and will soon receive bids for steel bridges. These are: A 300-ft. span with 56-ft. roadway at Elk street over the dock line tracks; a 75-ft. span with 50-ft. roadway at Kensington avenue over the belt line tracks; and 10 four-track railroad bridges ranging from 50-ft. to 99-ft. spans over subways of the Broadway & Belt Line tracks.

The contract for a bridge at Barley avenue has been awarded to Jones & Laughlin, Pittsburgh, Pa.

CALUMET, MICH.—Contract for the new passenger station of the Mineral Range Railroad, a subsidiary of the Duluth, South Shore & Atlantic, has been let to Edward Ulseth, of Calumet, and work is under way. This building will be of brick with sandstone trimmings and mosaic tile floors. The foundations will be of concrete and the roof will be steel trussed. (July 24, p. 596.)

CHAGRIN FALLS, OHIO.—See Cleveland, Ohio.

CHICAGO, ILL.—The Chicago & North-Western, it is said, has announced that its engineers and architects have completed the plans for the new Madison street passenger terminal, which will cost about $20,000,000, and include facilities for handling over 250,000 passengers every 24 hours. The new terminal will occupy four city blocks, bounded by Madison, Kinzie, Clinton and Canal streets.

CLEVELAND, OHIO.—Judge Tayler, of the Federal Court, has ordered the Wheeling & Lake Erie to raze its passenger station. Plans have been prepared for a new five-story structure to cost about $500,000. A station to handle traffic temporarily will be built just north of the present building. Other improvements to be made at once by Judge Tayler's order include: Repairing and strengthening bridges over the Baltimore & Ohio tracks at Cleveland, $20,000; painting steel bridges, $25,000; rebuilding roundhouse at Mingo, Ohio, $10,000; renewal of wooden bridges on the Avena branch, $16,000; moving abutment supporting the road on the Cleveland bridge, $8,000; freight station at Chagrin Falls, Ohio, $1,000.

COHOES, N. Y.—The New York Central & Hudson River has awarded the contract to Tucker & Vinton, New York, for the construction of a 60-ft. reinforced concrete bridge.

COLFAX, WASH.—The Spokane & Inland has prepared plans for a new brick passenger station to cost $18,000. Work on the structure, which will be opposite the court house, will begin August 15.

DELPHOS, OHIO.—The Northern Ohio has prepared plans for a new engine house, 20 ft. x 120 ft. The building will be of frame construction.

DENVER, COLO.—The Denver, Laramie & Northwestern has asked the city of Denver to close the streets and alleys on the tract of land bounded by Broadway, Forty-eighth, Huron and Fifty-second streets. This property is owned by the railroad and if the ordinance is passed, the company will begin the construction of its terminal facilities, including passenger and freight depots.

The city council of Denver has passed an ordinance closing Wewatta street between Eighteenth and Nineteenth streets and half a block of Eighteenth street in favor of the Union Depot Co., which has plans prepared for building a new union passenger station on that site. (June 19, p. 200.)

EAST LIVERPOOL, OHIO.—The Steubenville & East Liverpool Railway & Light Co. (Electric) has awarded a contract to the Guy Johnston Co., Toronto, Ohio, for the erection of a steel and brick car barn.

FT. WORTH, TEX.—The Missouri, Kansas & Texas will build new shops.

IRVING, N. Y.—The Lake Shore & Michigan Southern will build a 900-ft. bridge. It will have four tracks and will be built of steel and reinforced concrete. Work will be done by the company's forces.

LA SALLE, N. Y.—The up-state Public Service Commission has ordered the erection of a steel viaduct, with approaches, from Hamilton street, across the tracks of the New York Central, the Erie and the right of way of the proposed Buffalo, Thousand Islands & Portland, to eliminate grade crossings. Plans will soon be prepared and bids asked.

LITTLE ROCK, ARK.—The St. Louis Southwestern has prepared plans for new freight and passenger depots. The passenger station will be at the corner of Washington avenue and

Orange street. It will be 100 ft. x 140 ft., built of brick and stone. The two buildings will cost about $35,000.

Mingo, Ohio.—See Cleveland, Ohio.

New York, N. Y.—The Third Avenue Railroad is receiving bids for the construction of a four-story car barn, 129 ft. x 136 ft.

North Evans, N. Y.—The Lake Shore & Michigan Southern will build a 850-ft. bridge. It will have four tracks and will be built of steel and reinforced concrete. The work will be done by the company's forces.

Peoria, Ill.—The Chicago, Rock Island & Pacific is receiving bids through R. T. Hawk, Architect, La Salle street station, Chicago, for the freight house to be built at Peoria. It will be a one-story structure, 560 ft. x 46 ft., of mill construction, to cost $50,000. (R. R. G., May 10, p. 662.)

Racine, Wis.—The Chicago & North-Western has awarded contracts for the construction of the new steel and concrete bridge to cost $185,000. The contract for the sub-structure was given to G. W. Oakes, St. Paul, Minn., and for the superstructure to the American Bridge Co.

Rochester, Minn.—The Chicago & North-Western has awarded the contract to the Charles W. Gindele Co., Chicago, for the erection of a two-story addition to its passenger station. The contract price was $22,000.

Seguin, Tex.—The Galveston, Harrisburg & San Antonio has awarded the contract for building a passenger station to the Brooks-Gordon Construction Co., Houston, Tex., instead of to the Houston Co., as reported last week. It will be a one-story structure, 25 ft. x 80 ft., of pressed brick, to cost $15,000.

Salt Lake City, Utah.—See Oregon Short Line item under Iron and Steel.

Texarkana, Tex.—The Kansas City Southern will replace the roundhouse, recently burned. Plans are being prepared for a structure to cost $2,800.

West Albany, N. Y.—A sub-contract for the erection of the structural steel work of the shops for the New York Central & Hudson River has just been let to the Brown & Ketcham Iron Works Co. The total cost of the improvements to these shops will be about $250,000. (July 24, p. 59.)

SIGNALING.

The Louisiana Railroad Commission has issued an order requiring the railroads of the state to install interlocking devices at all crossings. The Louisiana roads are opposing the order on the ground that financial and traffic conditions do not warrant it. The New Jersey commission is considering the value of derails at interlocked crossings and is making an extended inquiry on the subject, following a recent case where a freight train at an interlocked crossing line ran over the derail and went on far enough to foul another line.

SUPPLY TRADE NOTES.

The G. Drouve Co., Bridgeport, Conn., has received an order for the skylights for the new car barns being erected by the Chicago City Railway Co.

George Wagstaff, Supervisor of Boilers of the New York Central & Hudson River, has resigned, effective September 1, to go to the Railway Materials Co., Chicago, Ill.

Wood & Van Nest, 26 Cortlandt street, New York, have made an arrangement with Toch Brothers, New York, and Klein-Logan Company, who have recently organized a railroad track tool department, to represent them as sales agents.

The Marion Steam Shovel Co., Marion, Ohio, was mentioned in our issue of June 26 as completing plans for an addition, 115 ft. x 350 ft., to its plant. The contract for the 600 tons of structural steel needed has been awarded to the McClintic-Marshall Construction Co.

The Harlan & Hollingsworth Corporation, Wilmington, Del., all of the stock of which is owned by the Bethlehem Steel Corporation, New York, is to build a plant in Wilmington for the manufacture of steel passenger coaches and steel freight cars. The Harlan plant will be rebuilt and enlarged.

G. R. Scanland, Assistant Auditor of the American Car & Foundry Co., at St. Louis, Mo., has been put in temporary charge of the office of District Manager at Jeffersonville, Ind., succeeding to the duties of John D. Ingram, deceased.

W. J. Haynen, whose resignation as Master Mechanic of the Gulf & Ship Island was announced in these columns recently, has been appointed Assistant General Manager of the J. J. Newman Lumber Co., with headquarters at Hattiesburg, Miss.

Richard Voges, who was connected with the Gold Car Heating & Lighting Co., New York, for many years, has resigned from that company to take a position with the Ward Equipment Co., 141 Broadway, New York, as Chief Inspector of Materials in the car heating department.

The Prier Brass Manufacturing Co., Kansas City, Mo., manufacturer of railroad and plumbing supplies, has bought two acres of land at Centropolis, a suburb of Kansas City, on which it will build a new plant. The main building will have ground dimensions of 55 ft. x 325 ft., and will include a foundry, machine shop, tin shop and plating room. W. H. Prier is President of the company.

R. B. Kadish & Co., 503 Fisher building, Chicago, dealers in railroad supplies, are the Chicago representatives of the Niagara Forged Steel Co., manufacturer of improved track equipment, and the Niagara Device Co., manufacturer of Niagara paint spray, sand blast machines and car movers. In addition to these supplies the company handles general car forgings, brake-shoes, brake-shoe keys, air-brake pins and gray iron journal boxes.

The Ostermann Manufacturing Co., West Pullman, Ill., reports that its business of freight car construction and repairing and rebuilding freight cars shows a marked improvement and that more men are now employed than at this time last year. The original plant, consisting of ten acres of buildings and yards, is at present nearly full of cars for repairing, and increased facilities are being added by erecting a new power house and enlarging the blacksmith and machine shops. In addition to these improvements, the company recently purchased 30 acres of land adjoining the present plant, and is now preparing plans for the erection of new shops and yards to enable it to handle future business.

Judge Taylor, in the United States Circuit Court for the Northern District of Ohio, has filed an opinion in favor of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., in a suit brought by that company against The Electric Controller & Supply Co., Cleveland, Ohio, for an alleged infringement of a controller patent. This suit was brought to prevent a further infringement of Lange & Lamme patent No. 518,693, granted April 24, 1894, by the manufacture and sale of electric controllers for crane and other service. The claims sued on relate to an improved construction of the controller drum or cylinder whereby the drum can be easily and cheaply constructed and the electric circuits thereof securely insulated from each other and from the controller shaft or ground. It was shown that about the only construction known prior to the Lange & Lamme invention was the wooden drum controller. The insulated metallic sleeves proposed by Lange & Lamme rapidly came into use, so that to date over 140,000 of these controllers have been put in service. This decision sustains a patent the claims of which cover nearly every form of drum controller now on the market.

TRADE PUBLICATIONS.

Tarvia.—The Barrett Manufacturing Co., New York, are distributing a neat booklet containing a large number of full-page illustrations of city, park and suburban driveways, on which this dust layer has been used.

Vacuum Cleaning.—The Spencer Turbine Cleaner Co., Hartford, Conn., have issued a catalogue describing its Spencer turbine suction cleaner. A number of half-tone cuts illustrate the uses to which this cleaner may be put.

Lovell Window Operator.—The G. Drouve Co., Bridgeport,

Conn., has just issued a folder describing the Lovell patented window operator. An illustration shows this sash operating device as it appears when installed, some 24 windows, part of a long row of windows, being shown.

Ruberoid Roofing.—The Standard Paint Co., New York, is distributing a mailing card, one-half of which contains extracts from letters telling of the fireproof qualities of this roofing. The other half shows a facsimile of a newspaper account of the burning of a building having a tar roof.

Triple Valves.—The Westinghouse Air-Brake Co., Pittsburgh, Pa., has just issued a 28-page instruction pamphlet, No. 5,034, on the type L triple valve. This is one of the standard Westinghouse instruction publications, containing half-tone and line cuts, with full instructions for the use of this type of valve.

High-Speed Fans.—The high-speed turbine fans manufactured by the Conveying Machinery Co., New York, are described in pamphlet No. 108. Three pages of tables are presented to enable engineers to quickly compute the pressures, volumes and horse-powers required for any desired installation.

Lamp Testing Watt Indicator.—A lamp testing watt indicator has just been placed on the market by the General Electric Co., Schenectady, N. Y., which was designed for the purpose of giving a practical demonstration of the relative watt consumption of metallic and carbon filament lamps. The instrument is of pocket size. It is fully described in Bulletin No. 4,609.

Lubricators.—A pamphlet issued by the Phenix Lubricator Co., Chicago, describes Phenix force-feed lubricator pumps for high-speed engines. Lubricators made for engines, having from one to ten feeds, are shown together with a description of the manner in which they are attached. Four pages are devoted to the names of some of the users of this type of lubricator.

Hart Convertible Cars.—The reference book for 1908 of the Rodger Ballast Car Co., Chicago, describes the Hart convertible car, used in construction, maintenance and as a gondola, together with illustrations and detailed drawings. A double-plow car for spreading ballast, and convertible box, stock and flat cars are also described. A list of the users of this type of car includes 147 names of railroads, industrial railways, contracting and manufacturing companies.

Steel Rigs.—A pamphlet recently issued by the Oil Well Supply Co., Pittsburgh, Pa., describes steel rigs for oil derricks. These rigs are built by the Carnegie Steel Co., Pittsburgh, Pa., on specifications of their engineers, following plans supplied by the Oil Well Supply Co. The catalogue contains, besides the descriptive matter, a number of line cuts and half-tone illustrations of oil derrick installations.

Automatic Voltage Regulators.—The General Electric Co., Schenectady, N. Y., has just issued two bulletins describing its improved automatic voltage regulators, made in various styles for the regulation of the voltage of one or two or more generators in parallel. Bulletins Nos. 4,601 and 4,602 describe fully the regulators for alternating and direct-current generators respectively, and contain diagrams showing the various connections and arrangements of the different styles of regulators.

Paint.—The educational and commercial section of the Paint Manufacturers' Association of the United States, The Bourse, Philadelphia, Pa., is sending out advertising matter each month to about 100,000 dealers, painters and architects for the purpose of enabling them to carry on a better campaign in the paint business. Circulars conveying suitable ideas for the furtherance of this project are now being distributed. The association will assist anyone interested, either by sending helpful literature or by answering questions.

Controllers for Power and Mining Service.—Bulletin No. 4,600, recently issued by the General Electric Co., Schenectady, N. Y., describes various types of controllers for use in connection with both a.c. and d.c. motors, on electric cars, locomotives, automobiles, trains, hoists, etc.; also in machine shops, rolling mills, pumping stations and printing plants. The bulletin describes the controller most suitable for a specific purpose and contains general data and dimensions which will be found valuable to anyone contemplating the installation of motor drive.

Abstracts of Title.—Clinton L. Caldwell, St. Louis, Mo., has issued a brochure describing a system of abstracting which takes the place of abstract books and indexes of every kind. The inventor claims a system superior to any now in use and one which is especially adapted to large abstract service, as in the case of railroad lands, timber lands, ore and mineral lands, etc. A copy of the brochure will be sent by the author to anyone interested.

Carborundum.—A 125-page, 6½-in. x 9-in. catalogue has just been issued by the Carborundum Co., Niagara Falls, N. Y. It describes the methods of producing carborundum, its characteristics, uses, etc. The many shapes of grinding wheels into which this abrasive material is shaped are illustrated by a large number of detail half-tone cuts, with dimensions. These include wheels for knife and tool grinding, universal and plain cylindrical grinding, car wheel and locomotive guide bar grinding, cylinder grinders, etc. This material is also made up into various shapes of oil stones.

Track Tools.—Hubbard & Co., Pittsburgh, Pa., have issued an illustrated catalogue, bound in board cover, 142 pages, describing the tools which they manufacture for railroads, mines, blacksmith shops, etc. In the process of manufacture the railroad track tools, made from solid steel, pass through a number of the operations, illustrations of which are given. Special attention is called to the report of tests of Hubbard & Co.'s open-hearth steel picks made by the Pittsburgh testing laboratory. The tools described include picks, rail tongs, spike mauls, claw bars, tamping bars, track chisels, etc.

Wire Glass in Lackawanna Terminal at Hoboken.—A particularly attractive pamphlet prepared for the Mississippi Wire Glass Co., New York, after consultation with Lincoln Bush, Chief Engineer of the Delaware, Lackawanna & Western, and Kenneth M. Murchison, who was the architect of the new Hoboken ferry buildings, describes in detail the present excellent terminal facilities of the Lackawanna at Jersey City. The pamphlet contains a large number of full-page illustrations, showing general views, interior and exterior details, with several views of the Bush train shed. Wire glass of four different kinds, polished maze, ribbed and rough, has been used throughout the terminal. The pamphlet also contains a number of line drawings.

Walschaerts Valve Gear.—The American Locomotive Co., New York, has recently issued a pamphlet containing a paper read by C. O. Rogers, Traveling Engineer of the American Locomotive Co., before the eighth biennial convention of the Brotherhood of Locomotive Engineers at Columbus, Ohio, last May. The paper explains in a simple and clear manner the principal action and construction of the Walschaerts valve gear. It contrasts it with the Stephenson link motion, and this, together with the clearness of the description, makes the pamphlet of particular interest and value to locomotive enginemen and firemen. Mr. Rogers also makes suggestions and recommendations regarding procedure in cases of breakdowns on the road. A number of illustrations of engines disconnected and blocked as recommended are given to assist in a clear understanding of the text. Copies of the pamphlet will be mailed on request by the American Locomotive Co.

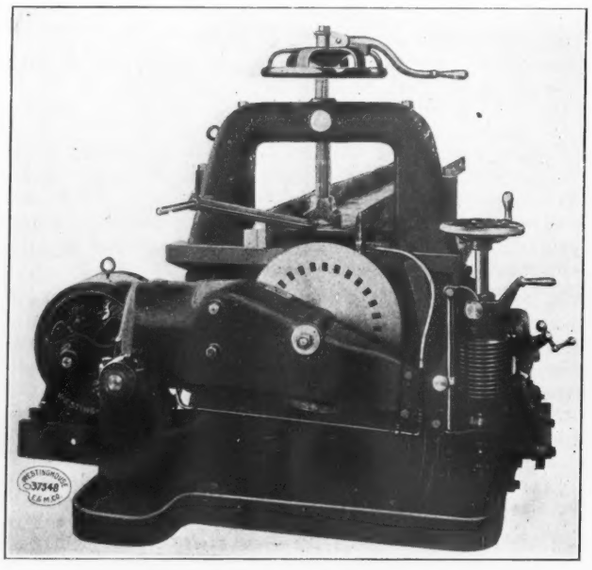
Tungsten Lamps; Switchboard Panels; Subway Transformers.—A series system, using Tungsten lamps for illuminating suburban districts, is fully described in Bulletin No. 4,607, just issued by the General Electric Co., Schenectady, N. Y. This description includes illustrations and general data on transformers, switchboards, lamp brackets and reflectors, series sockets and lightning arresters, used in connection with the system.

Bulletin No. 4,610 describes a new line of small plant continuous current switchboards. These boards are manufactured for 125 and 250-volt circuits only; they are made to control one generator and two feeder circuits, and additional feeder switches cannot be furnished.

Bulletin No. 4,608 describes the company's improved type H subway transformers. They are manufactured for a frequency of 60 cycles at standard voltages and in capacities of from 5 to 300 k.w., inclusive.

Motor Driven Cold Metal Saw.

Small cold saws for cutting off all sizes and shapes of metal work have become general in a great variety of plants. In many cases, however, it would be almost impossible to locate the saw so that it could be conveniently used without individual motor drive. In the average machine shop one or more saws are required in the stock room or some other equally inconvenient place for mechanical drive. By the use of a small motor on the saw the location may be selected without reference to any requirements except the convenience of handling the work. In structural iron works, the self-contained unit of motor and saw can be picked up by a crane and carried to any part of the building or yard.



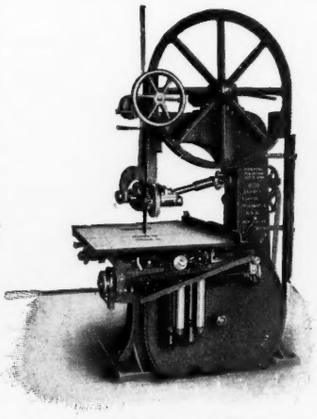
Motor Driven Cold Metal Saw.

The cold saw illustrated, which is one that does not require a bevel gear, is especially adapted to motor drive. The saw is made by the Lea Equipment Co., New York, and is fitted with a Westinghouse shunt motor. The size shown requires a 2½-h.p. motor and is capable of cutting 8-in. round stock. A Morse silent chain is used to connect the motor to the saw, instead of gearing.

To cut different metals with maximum efficiency, the speed of the saw must be adjustable. The peripheral speed should be 52 ft. a minute with a very coarse feed for structural iron, machinery steel and metals of this class. For annealed tool steel, a lower speed of but 37 ft. a minute is the most efficient. This same speed is also used on Krupp's chrome nickel steel. To get these speeds, an adjustable speed motor with speed range of 1⅓ to 1 is used, with a speed controlling rheostat.

Combined Rip and Resaw.

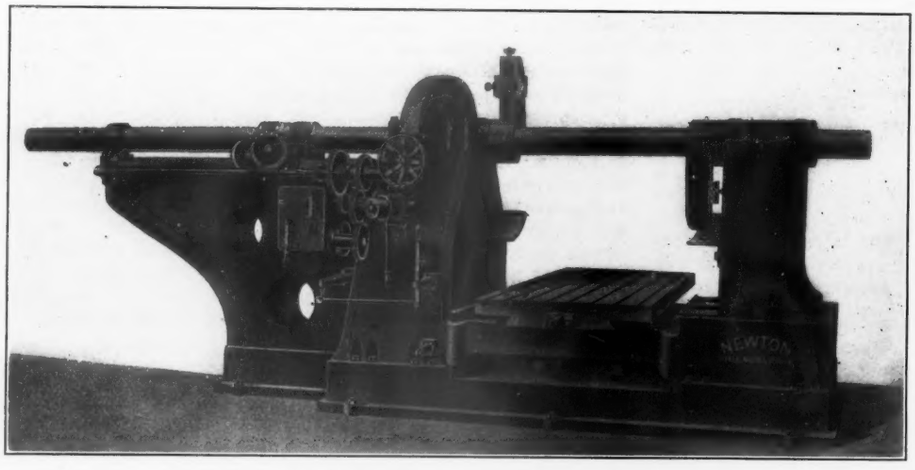
Designed for use in shops that do both ripping and resawing in small quantities, this machine is a practical and economical wood-working tool. The illustration shows the machine ready for ripping. The table, made in two parts, is mounted on a rocker bearing which permits it to be tilted to an angle of 15 deg. for bevelled siding. The part of the table which carries the resaw rolls can be instantly reversed, converting the machine into a rip saw. The feed rolls for ripping are placed as close together as possible, so that short pieces may be fed successfully. The machine will rip material 24 in. wide by 18 in thick. The resaw rolls are self-centering and will open to saw to the center of 8 in. The machine is equipped with a sensitive straining device to keep the band saw taut, which permits running the blade at a very high speed. This machine is manufactured by the J. A. Fay & Egan Co., Cincinnati, Ohio.



Combined Rip and Resaw.

Newton Boring Machine.

This machine, made by the Newton Machine Tool Works, Inc., Philadelphia, Pa., is especially designed for boring locomotive cylinders and valve chambers. The planed casting being placed on the table, the adjustments of which are vertical, longitudinal and transverse, the high and low-pressure cylinders and valve chamber may be bored without resetting the casting, which insures a correct cylinder alinement. The spindle is 7 in. in diameter made of 50 point carbon steel, accurately ground and fitted in sleeves. The machine has two splines for driving, the one in the main pedestal being used for driving the spindle by a 4-in. diameter phosphor bronze worm wheel and a hardened steel worm with roller thrust bearing, both of which are incased and run in oil. The other sleeve, fitted in the outboard bearing, is keyed to the spindle and revolves with it. These sleeves, lapped in the hole for the spindle so as to insure proper bearings, are ground on the outside and fitted in accurately scraped brass bushings, a cap bearing being provided for compensating for the wear. A special design of facing arm is fitted to each of these sleeves, and either may be engaged or disengaged without stopping the spindle motion. These facing arms are fitted with tool slides which have in and out adjustments. The star wheel and pin seen in the illustration provide for the feed. The spindle is fed forward by a trolley operated by screw and nut and has continuous motion of 140 in., permitting it to be entirely withdrawn for removing the casting. The following six changes of feed in either direction are provided: $\frac{1}{16}$ in., $\frac{1}{10}$ in., ⅛ in., ⅓ in., ⅔ in. and 1 in. A quick power motion in either direction is attained at the rate of 10 ft. per minute. The spindle has a speed range from 4 to



Newton Cylinder and Valve Chamber Boring Machine.

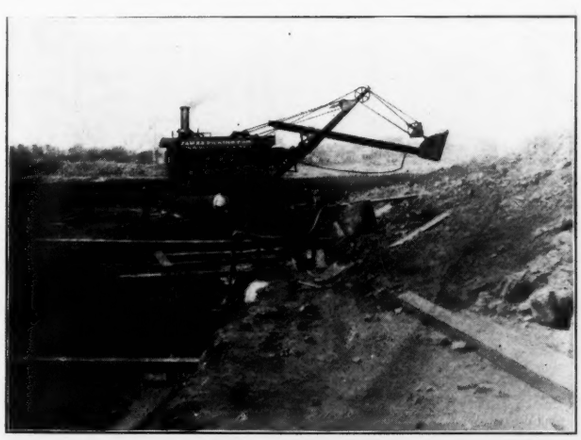
15 r.p.m., and is operated either by a four-step cone or 20 h.p., 3 to 1, variable-speed motor. The drive is clutched so that the spindle can be stopped or started without stopping the motor or countershaft. The motor is supplied with a fly-wheel to overcome the shock of engaging and disengaging the clutch.

The outboard bearing is adjusted by means of a rack and pinion to give a minimum distance of 45 in. and a maximum distance of 60 in. between the facing arms. The cross adjusting table is fitted with steel plates on the top, which give steel wings to the T slots, preventing them from breaking out, also insuring and maintaining the table alinement. This cross adjusting table has hand or power adjustment, or both, and is adjustable longitudinally on the knee in order to bring different lengths of cylinders between the facing arms. The knee is supported by four screws, each 6 in. in diameter, which are used to raise and lower the table and properly support it, giving a minimum distance of 43 in. and a maximum distance of 51 in. from the center of the spindle to the top of the table.

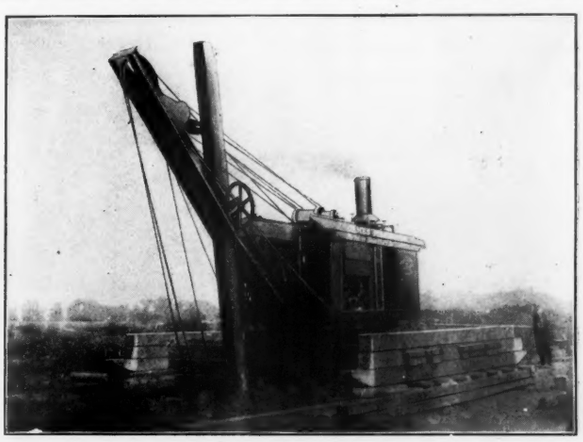
The method of driving and feeding this machine insures a smooth cut in the cylinder. It is especially useful for boring valve chambers, as the steady motion of the worm drive and screw feed prevents the tools gouging out the bridges. For use in boring inclined cylinders, an auxiliary table is furnished which can be swiveled to bore at an angle of 20 deg., without requiring an additional setting.

Revolving Steam Shovels.

The accompanying illustrations show two Vulcan revolving steam shovels at work in the large sewer trench now being dug at Fort Washington park, New York. This trench is 14 ft. wide and 16 ft. deep, running through a soft, marshy tract



Vulcan Revolving Steam Shovel.



Position When Digging.

of land, most of which is "made" ground, containing old timber and refuse, making it necessary to use sheeting to hold the trench walls in place. The shovels are built to deliver the material as far as 33 ft. from the center of their positions, or at any point in the circle, thus enabling the material taken out of the trenches to be dumped at various points. This feature is also of particular advantage in cases where the piping is being laid closely following the digging, since the shovel will deposit the material into the back-fill. Under ordinary conditions these shovels are operated by one man. The boom may be used much the same as an ordinary locomotive crane for handling the timbers and piping. The No. 2 Vulcan revolving shovel can make a complete revolution in one minute. Equipped with a one-yard capacity dipper, this shovel has made a trench 6 ft. wide and 12 ft. deep at the rate of 200 lineal feet per day of 10 hours. This record was made when dumping the material on one side of the trench, but it is stated that a similar amount of trenching can be made even when dumping in the back-fill. The Vulcan Steam Shovel Company, Toledo, Ohio, manufacturers of these shovels, has for several years past recommended its Little Giant shovel for trench work, and while this type has given satisfaction it has been found by experience that the revolving type has several advantages over the other. The No. 2 revolving shovel may be operated in trenches from 3 ft. to 18 ft. wide and from 6 ft. to 16 ft. deep, and the No. 1 operated in trenches from 2 ft. to 10 ft. wide and 6 ft. to 12 ft. deep.

Master Car Builders' Circular.

The Secretary of the M. C. B. Association has issued circular No. 1, giving a list of the standing and special committees, with instructions pertaining to the 1909 convention. They are as follows:

INSTRUCTIONS TO COMMITTEES.

In order to expedite the work of the convention of 1909, the following instructions regarding the preparation and presentation of the reports of committees were adopted by the Executive Committee at a meeting held in Chicago, Ill., on July 15, 1908

1. That all active, representative and associate members of the Association, immediately on receipt of this circular, transmit to the chairman of the respective committees all the information they may have on each subject, which they consider will be of assistance to the respective committees in preparing their reports.

2. That the chairmen of all standing and special committees prepare their circulars of inquiry and submit the same to the secretary for printing and issuing prior to September 1, 1908.

3. That prompt replies be made to the circulars of inquiry as issued by the different committees.

4. That the chairmen of all standing and special committees must have their reports in the office of the secretary not later than April 1, 1909, in order that the same can be printed and advance copies issued by May 1, 1909.

5. Committee reports which do not reach the secretary in time for printing and issuing by May 1, 1909, will be referred to the Executive Committee to decide whether the report shall be submitted to the convention.

6. That abstract only of all reports of standing and special committees be read by the chairman of same before the convention, together with whatever additional data may have been accumulated after April 1, 1909, to the date of the convention.

7. That the members of standing and special committees who may individually or collectively submit a minority report, must prepare the same so that it can be issued with the report of the majority of the committee, and substituted for the majority report in the event the convention should so decide.

8. That each member of a standing or special committee sign either the majority or minority report.

STANDING COMMITTEES.

Arbitration.—J. J. Hennessey, chairman, M.C.B., C., M. & St. P. Ry., West Milwaukee, Wis.; P. H. Peck, M.M., C. & W. I. R.R., Chicago, Ill.; E. D. Bronner, S.M.P., Mich. Central R.R., Detroit, Mich.; T. W. Demarest, S.M.P., Pennsylvania Lines, Fort Wayne, Ind.; W. A. Nettleton, G.S.M.P., Rock Island Lines, Chicago, Ill.

Standards and Recommended Practice.—T. S. Lloyd, chairman, S.M.P., D., L. & W. R.R. Scranton, Pa.; J. E. Buker, A.S.M., Illinois Central R.R., Chicago, Ill.; T. M. Ramsdell, M.C.B., Chesapeake & Ohio Ry., Richmond, Va.; R. L. Kleine, Chief Car Inspector, Pennsylvania R.R., Altoona, Pa.; W. E. Dunham, M.M., Chicago & North-Western Ry., Winona, Minn.

Train Brake and Signal Equipment.—A. J. Cota, chairman, M.M., C., B. & Q. R.R., Chicago, Ill.; F. H. Scheffer, S.M.P., N., C. & St. L. R.R., Nashville, Tenn.; R. K. Reading, S.M.P., Pennsylvania R.R., Buffalo, N. Y.; E. W. Pratt, M.M., C. & N.-W. Ry., Missouri Valley, Ia.; R. B. Kendig, M.E.L., L. S. & M. S. Ry., Cleveland, Ohio; T. L. Burton, General Inspector, C. R.R. of N. J., Jersey City, N. J.; W. F. Buck, S.M.P., A., T. & S. F. Ry., Chicago, Ill.

Brake-Shoe Tests.—W. F. M. Goss, chairman, University of Illinois, Urbana, Ill.; B. D. Lockwood, M.E., C., C., C. & St. L. Ry., Indianapolis, Ind.; G. W. West, S.M.P., N. Y., O. & W. Ry., Middletown, N. Y.

Coupler and Draft Equipment.—R. N. Durborow, chairman, S.M.P., Pennsylvania R. R., Altoona, Pa.; G. W. Wildin, M.S., N. Y., N. H. & H. R.R., New Haven, Conn.; F. W. Brazier, S.R.S., N. Y. C. & H. R. R.R., New York, N. Y.; T. H. Curtis, S.M., L. & N. R.R., Louisville,

Ky.; F .H. Stark, S.R.S., Pittsburgh Coal Co., Coraopolis, Pa.; Thos. Roope, S.M.P., C., B. & Q. R.R., Lincoln, Neb.; G. W. Smith, S.M., Mo. Pac. Ry., St. Louis, Mo.

Rules for Loading Materials.—A. Kearney, chairman, A.S.M.P., N. & W. Ry., Roanoke, Va.; C. E. Fuller, S.M.P., Union Pacific Ry., Omaha, Neb.; A. Stewart, G.S.M.P., Southern Ry., Washington, D.C.; William Moir, M.S., Northern Pacific Ry., St. Paul, Minn.; J. S. Lentz, M.C.B., Lehigh Valley R.R., South Bethlehem, Pa.; W. F. Keisel, Jr., A.M.E., Pennsylvania R.R., Altoona, Pa.; L. H. Turner, S.M.P., P. & L. E. R.R., Pittsburgh, Pa.

Car Wheels.—William Garstang, chairman, S.M.P., C., C., C. & St. L. Ry., Indianapolis, Ind.; W. C. A. Henry, S.M.P., Pennsylvania Lines, Columbus, Ohio; A. E. Manchester, S.M.P., C., M. & St. P. Ry., West Milwaukee, Wis.; W. B. Fowler, M.C.B., Canadian Pacific Ry., Montreal, Can.; R. L. Ettenger, C.M.E., Southern Ry., Washington, D. C.; R. F. McKenna, M.C.B., D., L. & W. R.R, Scranton, Pa; O. C. Cromwell, M.E., Balt. & Ohio R.R., Baltimore, Md.

Safety Appliances.—C. A. Seley, chairman, M.E., C., R. I. & P. Ry., Chicago, Ill.; A. La Mar, G.C.I., Pennsylvania Lines, Fort Wayne, Ind.; T. H. Curtis, S.M., L. & N. R.R., Louisville, Ky.; C. B. Young, M.E., C., B. & Q. R.R., Chicago, Ill.; LeGrand Parish, S.M.P., L. S. & M. S. Ry., Cleveland, Ohio; H. Bartlett, G.S.M.P., B. & M. R.R., Boston, Mass.; T. M. Ramsdell, M.C.B., C. & O. Ry., Richmond, Va.

SPECIAL COMMITTEES.

1. *Freight Car Trucks.*—A. Stewart, chairman, G.S.M.P., Southern Ry., Washington, D.C.; J. J. Tatum, S.F.C.D., B. & O. R.R., Baltimore, Md.; A. S. Vogt, M.E., Pennsylvania R.R. Altoona, Pa; J. F. DeVoy, M.E., C., M. & St. P. Ry., West Milwaukee, Wis.; G. A. Hancock, G.S.M.P., St. L. & S. F. R.R, Springfield, Mo.

2. *Splicing Sills.*—R. E. Smith, chairman, G.S.M.P., A. C. L. R.R., Wilmington, N. C.; W. F. Bentley, M.C.B., B. & O. R.R., Baltimore, Md.; H. L. Trimyer, G.F.C.D., S. A. L. Ry., Portsmouth, Va.; I. S. Downing, M.C.B., L. S. & M. S. Ry., Collingwood, Ohio; F. A. Torrey, S.M.P., C., B. & Q. R.R., Chicago, Ill.

3. *Freight Car Repair Bills.*—J. F. Deems, chairman, G.S.M.P., N. Y. Central Lines, New York City, N. Y.; J. E. Muhlfeld, G.S.M.P., B. & O. R.R., Baltimore, Md.; D. F. Crawford, G.S.M.P., Pennsylvania Lines, Pittsburgh, Pa.; F. H. Clark, G.S.M.P., C., B. & Q. R.R., Chicago, Ill.; J. G. Neuffer, S.M., Illinois Central R.R., Chicago, Ill.

4. *Air-Brake Hose.*—LeGrand Parish, chairman, S.M.P., L. S. & M. S. Ry., Cleveland, Ohio; Jas. Milliken, S.M.P., P., B. & W. Ry., Wilmington, Del.; R. W. Burnett, A.M.C.B., Canadian Pacific Ry., Montreal, Can.; J. R. Onderdonk, Engr. Tests, B. & O. R.R., Baltimore, Md.; J. A. Carney, S.S., C., B. & Q. R.R., W. Burlington, Iowa.

5. *Side Bearings and Center Plates.*—R. D. Smith, chairman, A.S. M.P., B. & A. R.R., Boston, Mass.; R. P. C. Sanderson, S.M.P., Virginian Ry., Norfolk, Va.; J. H. Manning, S.M.P., D. & H. Co., Albany, N. Y.; J. F. Walsh, S.M.P., C. & O. Ry., Richmond, Va.; F. F. Gaines, S.M.P., Cent. of Ga. Ry., Savannah, Ga.; C. A. Schroyer, S.C.D., C. & N.-W. Ry., Chicago, Ill.; G. C. Bishop, S.M.P., L. I. R.R., Richmond Hill, L. I.

6. *Painting Steel Cars.*—G. E. Carson, chairman, M.C.B., B. & L. E. R.R., Greenville, Pa.; T. Rumney, M.S., Erie R.R., New York, N. Y.; G. A. Schmoll, S.M.P., B. & O. R.R., Wheeling, W.Va.; J. M. Shackford, C.D., D., L. & W. R.R., Scranton, Pa.; J. T. Wallis, S.M.P., Pennsylvania R.R., Williamsport, Pa.

7. *Side and End Door Fixtures.*—C. S. Morse, chairman, M.C.B., W. & L. E. R.R., Toledo, Ohio; J. A. McRae, M.E., Mich. Cent. R.R., Detroit, Mich.; G. N. Dow, G.M.I., L. S. & M. S. Ry., Cleveland, Ohio; C. F. Thiele, G.C.I., Pennsylvania Lines, Columbus, Ohio; J. P. Young, G.F.C.D., Mo. Pac. Ry., St. Louis, Mo.

8. *Tank Cars.*—A. W. Gibbs, chairman, G.S.M.P., Pennsylvania R.R., Altoona, Pa.; C. M. Bloxham, M.C.B., Union Tank Line, New York, N. Y.; J. W. Fogg, M.M., Chicago Ter. Trans. Ry., E. Chicago, Ind.; William McIntosh, S.M.P., Central R.R. of N. J., Jersey City, N. J.; S. K. Dickerson, A.S.M.P., L. S. & M. S. Ry., Cleveland, Ohio.

9. *Train Pipe and Connections for Steam Heat.*—C. A. Schroyer, chairman, S.C.D., C. & N.-W. Ry., Chicago, Ill.; H. E. Passmore, M.M., T. & O. C. Ry., Kenton, Ohio; T. H. Russum, S.P.C.D., B. & O. R.R., Baltimore, Md.; T. H. Goodnow, M.C.B., L. S. & M. S. Ry., Chicago, Ill.; J. J. Ewing, M.E., C. & O. Ry., Richmond, Va.

10. *Classes of Cars.*—J. E. Muhlfeld, chairman, G.S.M.P., B. & O. R. R., Baltimore, Md.; C. B. Young, M.E., C., B. & Q. R.R., Chicago, Ill.; H. Bartlett, G.S.M.P., B. & M. R.R., Boston, Mass.; H. M. Carson, Asst. to G.M., Pennsylvania R.R., Philadelphia, Pa.; F. M. Whyte, C.M.E., N. Y. Central Lines, New York, N. Y.

11. *Salt Water Drippings from Refrigerator Cars.*—M. K. Barnum, chairman, Asst. to V.-P., C., B. & Q. R.R., Chicago, Ill.; G. W. Lillie, S.C.D., St. L. & S. F. R.R., Springfield, Mo.; W. E. Sharp, M.C.B., Armour & Co., Chicago, Ill.; E. W. Pratt, M.M., C. & N.-W. Ry., Missouri Valley, Iowa; P. Maher, S.M.P., C. & A. Ry., Bloomington, Ill.; D. C. Ross, M.C.B., Mich. Cent. R.R., Detroit, Mich.; W. C. Arp, S.M.P., Vandalia R.R., Terre Haute, Ind.

12. *Revision of Constitution and By-Laws.*—D. F. Crawford, chairman, G.S.M.P., Pennsylvania Lines, Pittsburgh, Pa.; F. H. Clark, G.S.M.P., C., B. & Q. R.R., Chicago, Ill.; T. H. Curtis, S.M., L. & N. R.R., Louisville, Ky.

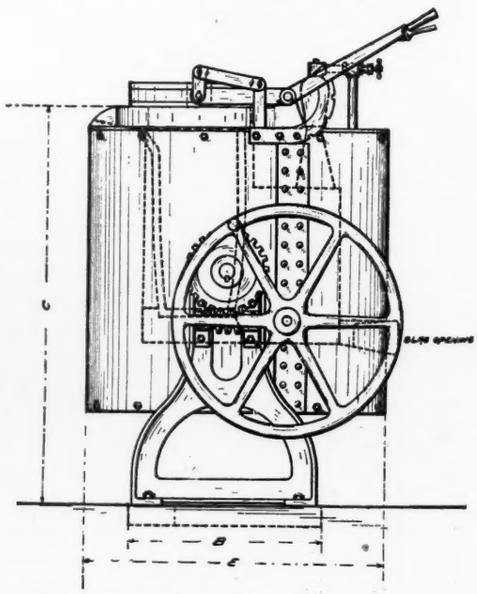
13. *Subjects.*—H. D. Taylor, chairman, S.M.P., P. & R. R.R., Reading, Pa.; A. W. Gibbs, G.S.M.P., Pennsylvania R.R., Altoona, Pa.; J. S. Lentz, M.C.B., Lehigh Valley R.R., S. Bethlehem, Pa.

14. *Arrangements.*—R. F. McKenna, G.F.C.D., D., L. & W. R.R., Scranton, Pa.

Tilting Crucible Furnace.

The accompanying illustrations show a tilting crucible furnace made by the Rockwell Furnace Co., New York, which has advantageous features. The crucible is not removed from the furnace while pouring, the metal being transferred to the mold by heated ladle or crucible. The burner, located at the top of the heating chamber, is operated with a 12-oz. fan blast using either oil or gas for fuel. The flame is projected down against the bottom of the chamber and not against the crucible, which insures the maximum life of the crucible. In case of its breaking, the melting may be continued with the metal in the furnace itself, the latter being tilted to prevent the molten metal from running out on the floor through the slag opening. This feature makes it safe to use crucibles after they have been worn thin, and they need not be thrown away before they actually break. This furnace is easily relined with simple and inexpensive fire tiles.

Rockwell Tilting Crucible Furnace.



Tilting Crucible Furnace.

As any air pressure from 12 oz. to 2 lbs. may be used, the furnace can be operated from any available air or oil system which may be supplying other furnaces, making it unnecessary to have a separate plant. The cover is manipulated by a lever conveniently located at the rear of the furnace, a pin engaging a ratchet and holding the door rigid in any position. This permits covering the crucible after pouring without returning the furnace to an upright position. Heavy pieces of metal may be fed to the crucible through the opening in the cover of the furnace while the blast is on, the waste heat passing through melting it down into the crucible rapidly. The crucible is not removed after the first heat and as the metal is charged into a hot pot, the melting is greatly facilitated. When it is essential that the heating gases in the furnace should not come in contact with the metal, a cover may be put on the crucible to protect it. This is unnecessary for ordinary work, as scrap yellow brass stampings have been melted sufficiently hot for pouring very light castings with

a loss of only 3 per cent., the only precaution taken while melting being to cover the metal with a few pieces of hard coal.

The number of heats per day varies from three to ten. The amount of fuel required will range as follows: Oil, 1½ to 3 gallons; natural gas, 210 to 420 cu. ft.; illuminating gas, 315 to 630 cu. ft.; 300 B.t.u. water gas, 675 to 1,350 cu. ft. The fuel requirement varies according to the quantity and the quality of metal melted, the heat at which the metal is required and the attention and promptness with which it is melted and poured. The above, however, is a fair average. The furnaces are made in four sizes, to hold Nos. 70, 125, 275 and 450 crucibles.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

W. D. Reid, Vice-President and General Manager of the Reid-Newfoundland Company, has been elected President and General Manager, succeeding, as President, Sir Robert G. Reid, deceased. H. D. Reid, Secretary, Treasurer and Assistant General Manager, has been elected also Vice-President.

A. Brady has been appointed Claim Agent for the Chicago, Rock Island & Pacific lines in Oklahoma, excepting the El Paso division. This territory has heretofore been part of the district under charge of A. H. Kilpatrick, Claim Agent at Little Rock, Ark. Mr. Brady will also have charge of that part of the Pan Handle division which is in Kansas. His office is at El Reno, Okla.

Operating Officers.

J. R. Nelson, the recently appointed Superintendent of the Canadian Pacific at London, Ont., was born in Montreal on December 9, 1876. After a high school education in Montreal, he began railroad work July, 1893, as office boy in the Purchasing Department of the Canadian Pacific at Montreal. The next year he worked as stenographer to the Chief Clerk in the Vice-President's office, and in 1897 was stenographer to the Vice-President. Two years later he was made Secretary to the President, and in 1900 was made chief clerk to the President. By October, 1903, he had become Superintendent of District No. 1 of the Lake Superior division, with headquarters at North Bay, Ont. In December, 1906, he was transferred, as Superintendent, to District No. 1 of the Ontario division. In October of the next year he was again transferred, as Superintendent, to District No. 3 of the Ontario division, and in 1908 was made also Acting Superintendent of District No. 2, which position he held until his recent appointment.

J. R. Nelson.

E. P. Bracken has been appointed Superintendent of the Galesburg division of the Chicago, Burlington & Quincy, with office at Galesburg, Ill., succeeding W. J. Mulhern. W. F. Thiehoff has been appointed Superintendent of the Brookfield division, with office at Brookfield, Mo.

Albert F. Reiner, the recently appointed Superintendent of the Chicago & North-Western at North Fond du Lac, was born in 1863 at Madison, Wis., and after a public school and business college education began railroad work in 1880 on the Chicago & North-Western as despatcher at Madison, Wis., since when he has been successively despatcher at Baraboo, Wis., Chief Despatcher and Trainmaster there, Trainmaster at Clinton, Idaho, and Assistant Superintendent at Baraboo. He held this latter position until his recent appointment.

Traffic Officers.

B. H. Hartley has been appointed Commercial Agent of the Seaboard Air Line at Atlanta, Ga., succeeding C. P. Pitchford.

E. A. McKenna has been appointed Traveling Freight Agent of the Northern Pacific at Walla Walla, Wash., succeeding G. D. O'Connor.

R. S. Palmer has been appointed General Agent of the Quincy, Omaha & Kansas City at Kirksville, Mo., succeeding E. S. Jacobs.

W. O. Rock has been appointed Division Passenger Agent of the Chicago, Burlington & Quincy at New York, succeeding H. W. Hawley.

L. D. Loomis has been appointed Freight and Ticket Agent of the Lehigh Valley at North Tonawanda, N. Y., succeeding J. W. Williams.

F. M. Seymour has been appointed Traveling Freight Agent of the Chicago, Burlington & Quincy at St. Louis, Mo., succeeding Eugene Saunders.

William W. Tull has been appointed Contracting Freight Agent of the Atlanta, Birmingham & Atlantic at New York, succeeding Hord Brown, resigned.

S. D. McLeish, Commercial Agent of the Lake Erie & Western at New York, has been appointed General Agent at that city, and his former office has been abolished.

J. R. Ballard, Commercial Agent of the Lake Shore & Michigan Southern at Minneapolis, Minn., has been appointed Commercial Agent at St. Paul, Minn., succeeding G. C. Knoche.

Carl Howe has been appointed Manager of the New York Central fast freight lines. W. F. Wilson has been appointed Assistant Manager. The offices of both are at Buffalo, N. Y.

The office of A. W. Nonnemacher, Special Passenger Agent of the Lehigh Valley, has been moved from New York to Allentown, Pa. H. J. Bills has been appointed Passenger Agent at Chicago.

W. H. Willis, Canadian Freight Agent of the Pennsylvania, with office at Toronto, Ont., has been appointed District Freight Solicitor at Pittsburgh, Pa., succeeding J. E. Weller. M. J. Fox succeeds Mr. Willis.

F. J. Burke has been appointed Commercial Agent of the International & Great Northern at Denver, Colo., succeeding J. M. Ball, transferred. B. A. Sullivan has been appointed Traveling Freight Agent at San Antonio, Tex.

G. C. Wilson has been appointed Acting City Freight Agent of the Canadian Pacific at Buffalo, N. Y., succeeding W. S. Nevins, resigned. Fred Nason has been appointed City Passenger Agent at San Francisco, Cal., succeeding W. C. Clawson, resigned.

S. P. Collier, Jr., Commercial Agent of the Atlantic Coast Line at Montgomery, Ala., has been appointed Division Freight Agent at Jacksonville, Fla., succeeding F. W. Kirtland, resigned to go to another company. G. A. Cardwell succeeds Mr. Collier. E. H. Smith has been appointed Commercial Agent at Cincinnati, Ohio, succeeding C. H. Trimble, promoted.

Charles A. Bland, Commercial Agent of the Georgia Railroad at Memphis, Tenn., has been appointed Traveling Freight Agent at St. Louis, Mo., and his former office has been abolished. R. C. Wharton, Commercial Agent at Chicago, has been appointed Traveling Freight Agent at St. Louis, and his former office has been abolished. W. E. Gauvin, Traveling Freight Agent at St. Louis, retains his office.

Engineering and Rolling Stock Officers.

George Wagstaff, Supervisor of Boilers of the New York Central & Hudson River, has resigned, effective September 1, to go to the Railway Materials Co., Chicago, Ill.

J. A. Mitchell, Locomotive Foreman of the Grand Trunk at Stratford, Ont., has been appointed Locomotive Foreman of the Grand Trunk Pacific, with office at Rivro, Man.

W. J. Haymen, whose resignation as Master Mechanic of the Gulf & Ship Island was announced in these columns recently, has been appointed Assistant General Manager of the J. J. Newman Lumber Co., with headquarters at Hattiesburg, Miss.

The office of Chief Signal Supervisor of the New York Central & Hudson River has been abolished. A. J. Loughren, Signal Supervisor at Spuyten Duyvil, N. Y., has been appointed Signal Supervisor of the Western division, with headquarters at Rochester, N. Y., succeeding M. M. Hayes, transferred. The authority of C. H. Wiegand, Signal Supervisor of the Hudson division, has been extended to include the Exterior Zone, formerly under the supervision of Mr. Loughren.

J. H. Gimple, whose appointment as Master Car Builder of the Vera Cruz & Isthmus we have announced, was born in 1875 at De Soto, Mo. After a common school education, he began railroad work in 1892 as an apprentice in the coach shops of the St. Louis, Iron Mountain & Southern. In 1897 he was appointed coach builder of the National Railroad of Mexico, and by 1902 he had become Master Car Builder of the National Lines of Mexico. In 1905 he was appointed Foreman of the Car Department of the Missouri Pacific at Kansas City, Mo., which position he held until he was appointed to his present position. He is also performing the duties of Master Mechanic.

J. W. Mulhern, the recently appointed Superintendent of the Chicago & Alton at Bloomington, Ill., was born in 1863 at Naples, Ill. After a common school education he began railroad work in 1881 on the Chicago, Burlington & Quincy as track man and freight house clerk at Beardstown. Two years later he was made freight and passenger conductor, and by 1887 had become a conductor on the Illinois lines of the C., B. & Q. In October of that year he was appointed Yard Master at Winthrop, Mo. In 1888 he was transferred, as Yard Master, to Kansas City, Mo. The next year he was made Night Train Master at Brookfield, Mo. Two years later he was made Train Master at Brookfield, and on December 1, 1902, was promoted to Superintendent of Terminals at Kansas City. In 1904 he was made Superintendent of the Hannibal division and the next year transferred, as Superintendent, to the Galesburg division, which position he held until his recent appointment on the Chicago & Alton.

J. W. Mulhern.

F. K. Irwin, who recently succeeded V. V. Wiggin as Superintendent of Bridges and Buildings of the New York, New Haven & Hartford, was born in 1859 in Mobile, Ala. He graduated from Stevens Institute as a mechanical engineer in the class of 1883 and began work the next year with the Wisconsin Central as draftsman in the mechanical department. He has been, successively, Mechanical Engineer of the Wisconsin Central, Assistant Engineer of the Union Pacific in charge of shop construction and equipment, construction engineer of the New York, New Haven & Hartford, and, since April 1, 1905, in charge of repair shop construction, power house and substation construction on the New Haven.

R. A. Bainbridge, who a short time ago was appointed Division Engineer of the Esquimalt & Nanaimo branch of the Canadian Pacific, with headquarters at Victoria, B. C., was born in 1865 in Northumberland, England. He went to Bramham College, Leeds, England, and to Wharfedale College, Boston, England. He began railroad work in 1886 on the Canadian Pacific as a rodman on the line between Montreal, Que., and Sherbrooke. He later worked on the Regina & Prince Albert branch of the Canadian Pacific, and by 1890 had become Assistant Engineer on the Columbia & Kootenay branch. The next year he was appointed Assistant Engineer of Improvement and Maintenance of Way and Structures on the Pacific division. In 1901 he was appointed Resident Engineer of the Kootenay district, and in 1905 was made Assistant Division Engineer of the Pacific division, which office he held until his recent appointment.

C. E. Fuller, who was recently appointed Superintendent of Motive Power and Machinery of the Union Pacific, began railroad work as draftsman on the Vandalia Railroad at Terre Haute, Ind., in 1880. During the three years he remained here he also took a special technical course. In 1883 he was made machinist's apprentice and foreman of the Vandalia, and in 1889 was made General Foreman of the Hornell shops of the Erie. The next year he was made Master Mechanic of the Erie at Jersey City, N. J., and in 1892 was made Superintendent of Motive Power of the Central Vermont at St. Albans. In 1900 he returned to the Erie as Master Mechanic at Susquehanna, Pa., and the next year was made Assistant Mechanical Superintendent at Meadville. In 1903 he was made Superintendent of Motive Power of the Chicago & Alton. On Feb. 1, 1908, he was appointed Assistant Superintendent of Motive Power and Machinery of the Union Pacific, which position he held until his recent appointment.

OBITUARY.

E. J. Sanford, President and Superintendent of the Union Depot Co., of Kansas City, Mo., died on August 6, at Colorado Springs, Colo., following a short illness due to uraemia. He was born June 5, 1848, at Canton, St. Lawrence county, N. Y., and began railroad work in 1865 as telegraph operator and baggage agent on the Chicago & Alton. He was afterwards made Assistant Superintendent of the same road. For nine years he was Secretary of the Superintendents' Association at Kansas City and Chief of the Kansas City Car Inspection Bureau.

Railroad Construction.

New Incorporations, Surveys, Etc.

Atlanta, Birmingham & Atlantic.—President H. M. Atkinson is reported as having said that track has been laid to a point within five miles of Pelham, Ala., and that the connection with the Louisville & Nashville at this place will be in use inside of two months. This will give service into Birmingham, Ala. (July 17, p. 553.)

Bakersfield & Ventura.—Incorporated in Santa Clara county, Cal., to purchase, maintain, operate, extend and complete the electric railway formerly owned by the Bakersfield & Ventura Railway Co., which was sold by the Title Insurance & Trust Co., Los Angeles, Cal., to E. W. Phelps, as special administrator. Lines will be built from Hueneme, Cal., to Round Mountain; from Los Angeles to Santa Cruz, and a branch line from Sargents to Hollister. (R. R. G., March 13, p. 389.)

Burr's Ferry, Browndel & Chester.—This road has been extended from Alridge, Tex., to Turpentine, three miles. (R. R. G., April 17, p. 390.)

Canadian Pacific.—The new Hanover branch on the Ontario division, extending from Saugeen Junction, Ont., west to Hanover, 28 miles, has been opened for business. The new St. Mary's branch, extending from Code Junction north to St. Marys, 21 miles, has also been opened.

Chicago & Wabash Valley.—See Dinwiddie & Gary.

Chicago, Milwaukee & St. Paul.—An officer is quoted as saying that the Jim River division from Aberdeen, S. Dak., west to Mobridge, 98 miles, is being rebuilt to carry heavier traffic and that the work is two-thirds completed. The line from Minneapolis, Minn., to the Missouri river was all in good condition except where 10 miles had to be reballasted, and this has just been done.

DINWIDDIE & GARY.—Organized to extend the Chicago & Wabash Valley from its present northern terminus 25 miles to Gary, Ind. The officers are: B. G. Gifford, President; J. W. Belshaw, Vice-President; E. E. Lewis, Secretary; E. Schooley, Treasurer.

DURHAM & CHARLOTTE.—This road has been extended from Little River, N. C., to Troy, four miles.

EMPIRE RAILWAY, MINING & MILLING CO.—Incorporated in Colorado to build a railroad from Empire, Colo., northwest through the Daly mining districts and thence to Grand county, to a connection with the Denver, Northwestern & Pacific at or near Fraser; also a line southwest from Empire through Montezuma and Breckenridge to Leadville, connecting there with the Denver & Rio Grande and other lines; also a line from Empire through Idaho Springs to Denver. The incorporators are: F. G. Bishop, Empire; N. H. Brown, W. L. Shaffer and E. M. Sobin, all of Idaho Springs.

GRAND TRUNK PACIFIC.—The Canadian White Co. has received a sub-contract for grading eight miles west of Winnipeg, Man.

It is announced that regular train service will be inaugurated between Winnipeg, Man., and a point 60 miles west of Saskatoon, Sask., by the end of August, and that trains will be running from Winnipeg to a point 70 miles west of Edmonton, Alb., before January 1.

HA HA BAY.—This recently incorporated company will soon award the contract for the construction of a line between Jonquieres, Que., and Bagotville, 20 miles.

IDAHO NORTHERN.—This company has secured its right of way for a road 33 miles long from Enaville, Idaho, on the Oregon Railroad & Navigation, to a point several miles beyond Murray. Work on the grade between Enaville and Eagle City is nearly completed and the work of laying steel will be begun as soon as the rails are delivered. All other supplies have been assembled at Enaville. The only portions of the grade between the latter point and Eagle City that have not been completed are the cuts and rock work; these will be finished before September 1. A station will be established at Enaville which will be used jointly by the Oregon Railroad & Navigation and the Idaho Northern. Other stations will be established at Murray, Steamboat Creek, Beaver Creek, Eagle Creek and Raven. Rolling stock for the road has already been purchased, including three locomotives especially designed for the heavy grades. The cars will include ore and logging cars. A single passenger coach will be operated at the beginning.

INTERSTATE RAILWAY & POWER CO.—See Kansas City Union Trust Co.

KAKSAS CITY, MEXICO & ORIENT.—This line has been extended from Benjamin, Tex., north to Truscott, 12.6 miles. (R. R. G., April 17, p. 559.)

KANSAS CITY UNION TRUST CO.—It is said that this company is being organized to finance a system of interurban electric railways for the Interstate Railway & Power Co., which proposes to build from Kansas City, Mo., to various points in Kansas and Oklahoma.

KANSAS-COLORADO ELECTRIC RAILROAD & POWER CO.—Work, it is said, has been started at a point 25 miles south of Colorado Springs, Colo., and nine miles west of Pueblo, on a road to be built from Canon City, via Turkey Creek, to Pueblo. The line is eventually to be extended to Colorado Springs, where connection with Denver will be made over the Denver & South Platte.

LAKE CHARLES RAILWAY & NAVIGATION.—President W. P. Weber is quoted as having said that the road now has 20 miles of standard gage line in operation from Hecker, La., and that it is the intention to extend to Kinder, La., where a connection will be made with the Colorado Southern, New Orleans & Pacific. G. M. King, Vice-President and Treasurer, Lake Charles; D. A. Kelly, General Manager, Edna.

LAKE VIEW TRACTION.—It is said that a contract has been let to M. J. Roach to build a line from Memphis, Tenn., to Lake View, Miss., 12 miles, to cost about $189,000. Work to be completed by January, 1909. R. F. Tate, President, and W. W. Hayden, Chief Engineer, both of Memphis.

LOUISVILLE & NASHVILLE.—See Atlanta, Birmingham & Atlantic.

MATANE & GASPE.—Contract let to H. J. Beemer & Co., New York, for building 35 miles of road, with sidings, from St. Flavie, Ont., to Matane. Work will begin at once.

NORFOLK & WESTERN.—A new branch on the Scioto division, extending from Wayne, W. Va., to East Lynn, eight miles, has been opened for business.

NORTH COAST.—One hundred and fourteen deeds to property within the city limits of Spokane, Wash., were filed by this road on July 25. The property affected is said to be an almost unbroken strip from the city hall to the southwestern city limits, and to be worth about $1,000,000. Including branches, the road is to be 701 miles long, as follows: Spokane to Seattle, 378 miles; Portland Junction, Wash., to Portland, 85 miles; Kiona to Walla Walla, 68 miles; Ritzville Junction to Walla Walla, 84 miles; Spokane to Tekoa, 41 miles; Ritzville to Davenport Junction, 45 miles. About 40 miles have been graded in the Yakima Valley and construction is in progress on the Palouse branch between Spokane and Tekoa. R. E. Straborn, Spokane, President.

OCEAN SHORE (ELECTRIC).—It is said that this company has recently closed several large contracts for the completion of the line from San Francisco, Cal., south to Santa Cruz. The gap of 37 miles between Granada on the north and Scotts Creek on the south is to be closed as rapidly as possible. President Harvey is quoted as saying that he hopes to see through trains in operation by January 1.

ROME & OSCEOLA.—The up-state New York Public Service Commission has authorized this company, which has $500,000 capital stock, to build a steam railroad from Rome, N. Y., north to Osceola, in Lewis county, about 25 miles. It is said that this line will run through the towns of Lorena, Lee Center, Point Rock and Swanscote Mills. W. P. White, President.

SAVANNAH VALLEY.—Chartered with $50,000 capital stock to build from Garnett, Ga., south to Sylvania, about 15 miles. E. F. Comer, of Garnett, and L. J. Kilpatrick, of Athens, are the incorporators.

SOUTHERN PACIFIC.—A new branch on the Los Angeles division, running from Colorado, Cal., northeast to Potholes, 12 miles, has been opened for business.

TEXAS SOUTHERN.—See this company under Railroad Financial News.

TEXAS UNION TRACTION.—It is said that this company is to build a standard gage electric railway from Paris, Tex., southwest to Bogata, about 25 miles, and that preliminary surveys have been made. C. P. Moore, President, Longfellow, Tex.; J. T. Upchurch, Treasurer, Clarkesville, Tex.

UNION PACIFIC.—It is said that E. H. Harriman has given orders for this road to complete its double track from Omaha, Neb., to Grand Island. This improvement was started last year but was suspended at the time of the financial depression in October.

WASIOTO & BLACK MOUNTAIN.—Chartered in Bell county, Ky., with $50,000 capital, to build a line from a point 500 ft. south of mile post 205 on the Louisville & Nashville, via Cumberland river to Tomscreek. T. J. Asher, Robert Asher and M. Brandenburg, of Wasioto, Ky., are interested.

WEAVERVILLE ELECTRIC CO.—It is said that the Asheville Fuel & Dray Co. has begun work on this line from New Bridge Station, N. C., on the Asheville Rapid Transit line, northwest to Weaverville, four miles. (July 17, p. 555.)

WHEELING & LAKE ERIE.—Judge Tayler, of the Federal Court, has ordered this company to spend $72,250 in the renewal of ties and $17,750 for laying 90-lb. rails on the main line between Bolivar, Ohio, and Zoar.

Railroad Financial News.

Atchison, Topeka & Santa Fe.—J. P. Morgan & Co. have bought $17,000,000 Atchison, Topeka & Santa Fe "Transcontinental Short Line" first mortgage 15-year 4 per cent. bonds. The bonds are part of an authorized issue of $30,000,000 and are a first mortgage on some newly constructed lines at the rate of $24,500 a mile. This mileage includes the 270 miles of the Belen Cut-off, from Texico, N. Mex., to Rio Puerco, and the 370 miles of line comprising the Pecos Valley & Northeastern, running from Pecos, Tex., to Amarillo.

Boston & Suburban Electric.—The Massachusetts Board of Railroad Commissioners on August 1 decided that a charge of one cent for each transfer issued by the Newton Street Railway, for use on its own or connecting lines, was reasonable.

Canadian Northern.—The Senate and the House of Commons of Canada have passed a law authorizing the government to guarantee the principal and interest of 3½ per cent. 50-year bonds or debentures secured on 609 miles of branches of the Canadian Northern, and to be issued at the rate of $13,000 per mile as the lines are built.

Central Park North & East River.—The receivers of the Metropolitan Street Railway discontinued the operation of the line of the Central Park North & East River on August 6, and at the same time the giving of transfers to and from these lines was, with some exceptions, discontinued. The Central Park North & East River includes the Fifty-ninth street crosstown electric, the West Belt horse car line, the Fifyt-fourth street and South Ferry, and the East Belt horse car line. Transfers are still being issued to the Belt lines at Thirty-fourth street and at Forty-second street, but the Fifty-ninth street cars now run almost empty.

Chicago Consolidated Traction.—William F. Harrity, Chairman of the 4½ per cent. bondholders' protective committee, says: "We are advised by counsel that the Chicago Railways Company is liable for the principal, and interest, of the Consolidated Traction 4½ per cent. bonds as the successors of the Union Traction Company, the guarantors of such bonds."

Chicago Railways Company.—See Chicago Consolidated Traction.

Cornwall & Lebanon.—A semi-annual dividend of 3 per cent. was paid on August 1 on the stock of this company. This reduces the annual rate from 8 per cent., paid in 1907, to 6 per cent.

Cripple Creek Central.—A dividend of 3 per cent. for the nine months ended June 30, 1908, has been declared on the $3,000,000 4 per cent. non-cumulative preferred stock. In January, 1908, the usual dividends on both the preferred and common stocks were passed. With the present distribution, the preferred stock will have received dividends at the rate of 4 per cent. since 1904.

Delaware & Hudson.—On August 6 the up-state Public Service Commission held a hearing in regard to the petitions of the Delaware & Hudson to issue securities as follows: $4,665,295 to cover the acquisition of securities of the United Traction; $230,846 for securities of the Troy & New England (Electric), and $2,500,000 to cover advances to the Hudson Coal Co. At this hearing it was brought out that the Delaware & Hudson and the New York, New Haven & Hartford have planned to make a connection by way of Troy, and it was with this in view that the Troy & New England, running from Troy, N. Y., to Averill Park, was bought by the D. & H. Decision in regard to the issue of bonds by the Delaware & Hudson has not been rendered yet.

Metropolitan Street Railways.—See Central Park North & East River.

National Railroad of Mexico.—A semi-annual dividend of 1 per cent. has been declared on the preferred stock of the company. A large majority of this stock is deposited under the merger plan of the National Railways of Mexico. Annual dividends at the rate of 2 per cent. have been paid since 1906, with the exception of the dividend due last February. See National Railways of Mexico.

National Railways of Mexico.—A semi-annual dividend of 1 per cent. has been declared on the first preferred stock. The dividend will be paid to registered holders of the certificates of deposit of the National Railroad of Mexico preferred stock. See National Railroad of Mexico.

New York City Railway.—See Central Park North & East River.

See Second Avenue Elevated.

Norfolk & Western.—Stockholders are to vote at the annual meeting October 8 on the acquisition by purchase, consolidation or merger of the properties and franchises, of the following companies, owning in all less than 100 miles of road: Lynchburg Belt Line & Connecting; Pocahontas & Western; Big Sandy, East Lynn & Guyan; Caretta Railway; West Virginia, South Western & Big Stony Railway.

Second Avenue Elevated (New York).—Default having been made on the August 1 interest coupons of the $5,631,000 first consolidated bonds, the following protective committee has been formed and request the deposit of the bonds with the Guaranty Trust Co., New York: John W. Castles, Chairman; Henry S. Redmond, G. G. Haven, Jr., John W. Homer, and Alexander J. Campbell, Secretary. The road was leased in 1898 to the Metropolitan Street Railway, which agreed to pay 8 per cent. on the $1,862,000 stock for the first three years, and 9 per cent. thereafter. The March 1 dividend has been paid, but the June dividend is in default.

Texas Southern.—The property of this company was sold at receiver's sale on August 4 to the Union Trust Co., St. Louis, Mo., the purchase price being $286,000. J. F. Strickland, one of the purchasers, has said that if the sale is confirmed they will proceed at once to put the road in good condition and build an extension south from Marshall, Tex.

Underground Electric of London.—A syndicate headed by Speyer & Co., New York, have offered to the holders of the company's shares, and of its profit sharing secured notes, the privilege of subscribing at 93 for £1,000,000 ($5,000,000) 5 per cent. prior lien bonds, due 1920. The underwriting syndicate took the bulk of this issue of £1,000,000 remaining unsubscribed. The stockholders and holders of the profit sharing secured notes were under no obligation to subscribe for the prior lien bonds and the failure of the stockholders to subscribe in no way changed their position in the reorganization plan. (R. R. G., April 24, 1908, p. 592.)

Union Traction (Indiana).—This company, which is leased to the Indiana Union Traction Co., is not to pay dividends on its $7,500,000 common stock, because no rental has been paid by the lessee company. Rental payments are based on gross earnings.

Vera Cruz & Pacific.—This company has changed its name to the Vera Cruz & Isthmus.

Virginia Passenger & Power.—The reorganization plan of this electric road, which operates lines in and around Richmond, Va., calls for a new company with $7,500,000 common stock, $5,000,000 preferred stock, and $15,000,000 bonds.

Wabash-Pittsburgh Terminal.—The second mortgage bondholders' committee, John W. Castles, Chairman, has given notice that deposits of the second mortgage bonds will be received until August 31.

Wheeling & Lake Erie.—The receiver has been authorized to issue $300,000 receiver's certificates, and it is said that these certificates have already been sold.

Winnebago Traction.—All the property of this company was sold on August 6, for $950,000, to Oliver C. Fuller, F. C. Best and R. L. Smith, of Milwaukee, Wis. It is said that line will now be associated with the Wisconsin Railway & Light interests.